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The New "National" Direct Current Machine.

Among the recent incandescent apparatus placed upon the market, the machine illustrated in this number of the REVIEW takes a prominent position in the direct current lighting field. This machine is built by the National Electric Manufacturing Company, at Eau Claire, Wisconsin, and is claimed to possess distinctive features of merit. In producing this dynamo, the manufacturers did not attempt to get up a distinctively new type of dynamo, but their aim was to take a well known type and build it as nearly perfect, mechanically and electrically, as such a machine could be made, and this object, we are informed, has been fully accomplished.

The field is of the well known two-pole type, embracing a Siemens armature, wound in a peculiar manner, by which the amount of dead wire at the ends of the armature has been materially reduced, making the shaft correspondingly shorter, and insuring rigidity and freedom from vibration. The commutator is made of tempered copper, and presents ample bearing surface to the brushes, which, by the way, do not spark the least, thereby practically overcoming the objection usually raised against the use of commutator and brushes in this form of apparatus.

One of the most noticeable features of the machine is the small size as compared to its output, showing that the electrical determinations have been made in a very careful manner. The machines are all compounded for a potential of 100 volts, unless otherwise ordered, and the results as witnessed by the writer, were, to say the least, remarkable. While at the factory, recently, our correspondent had an opportunity of witnessing the final tests of a 500-light machine just completed. At this test the load of the machine was changed from full load to nothing, showing a scarcely noticeable movement of the voltmeter needle, and that, we were informed, was entirely due to the momentary speeding up of the engine.

In connection with the dynamo, the above company furnish an improved lamp, shown on page 9. The reader will doubtless notice the new form of bulb in which the filament is mounted; the nipple or projection at the end of the bulb having been abandoned, making a much neater and more tasteful appearance. The filaments of these lamps are made under the de Khotinsky patents. The makers claim not only a remarkably long life for them, but the entire absence of the usual discoloration of the bulb after the lamp has burned a considerable length of time. In addition to the dynamo and lamps, the company manufacture a full line of the usual accessories necessary for a complete system of electric lighting.

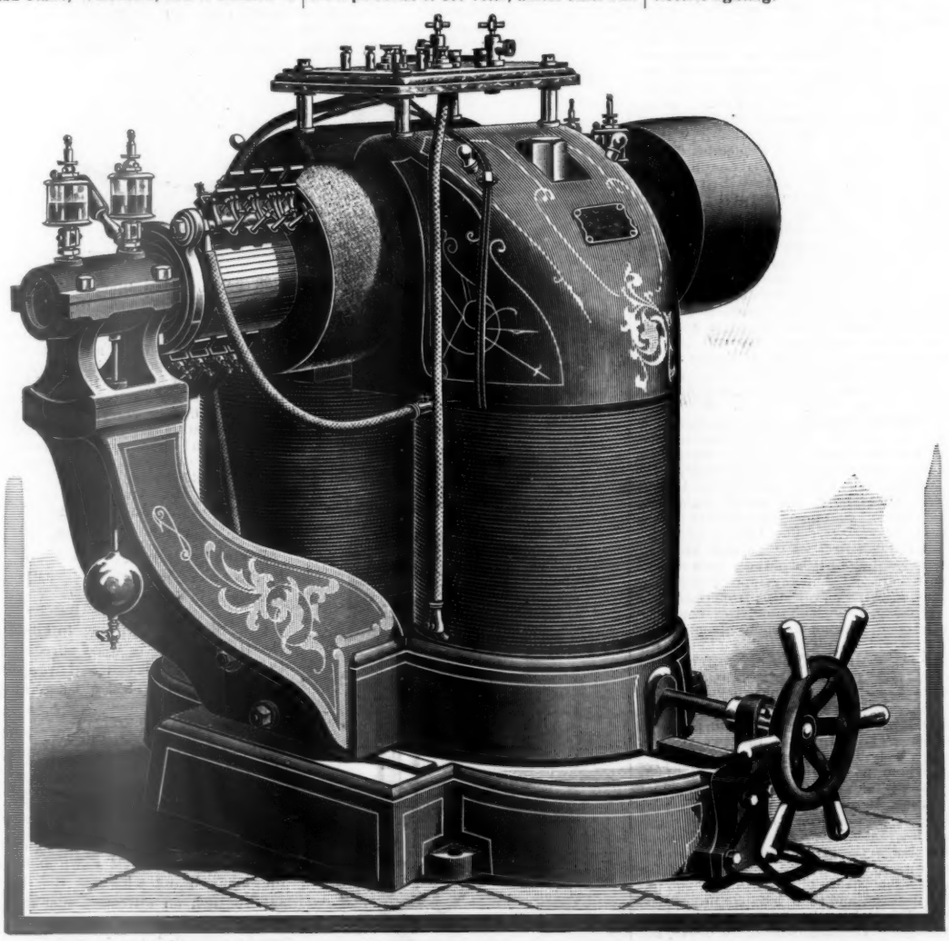

FIG. 1.—NEW DYNAMO OF THE NATIONAL ELECTRIC MANUFACTURING COMPANY, EAU CLAIRE, WIS.

Is there Platinum in Mexico?

It is reported that Mr. Flavio Lobato, a well-known mining engineer and analytical chemist, has discovered platinum in some ores from the Las Yedras mines in the State of Sinaloa. If this report is true it will very probably effect the market price of this scarce metal.

The American Association for the Advancement of Science will meet this year at Indianapolis, under the presidency of Prof. Goodale. The first meeting will be held on August 19th. The subject selected in advance for special discussion is "The Geographical Distribution of North American Plants," and papers upon it will be presented by Messrs. Watson, Macoun (of Ottawa), Sargent, Britton, Underwood, Halsted and Coul.

MAYNARD IN DETROIT.

THERE IS MUCH OF ELECTRICAL VALUE AND INTEREST IN THE "CITY OF STRAITS."

"Progress" is the word that fits the "City of the Straits." Electrical industries are leaders in the procession. Far-sighted enterprise and independence have always been characteristic of the men prominent in things electrical. There lives here, to-day, Judge J. J. Speed, an old telegraph operator, who used to call himself "Jack the 3d." It was his father who, when the Morse telegraph was being introduced by F. O. J. Smith in the East; by Amos Kendall in the South; by O'Reilly and Shaffner in Ohio and Kentucky, foresaw the great value and importance of the new invention and immediately commenced building a line from Detroit to Milwaukee, over the Michigan Central Railroad. The Erie & Michigan Line was a great success, and it brought together men whose ability and enterprise have been a power in the land from that time to this. Among the operators were A. B. Cornell, with a salary of $400 per annum; Emory Cobb, $300; J. J. S. Wilson, $175; while J. H. Wade received $400, and added something to his capital for investment in the stock of the company by painting portraits. Of the other operators on this line, Josiah D. Moseley, 70 years old, is living in Iowa, and Rev. Jabez Fox is a prominent clergyman of the Swedenborgian Church, in Maryland. Long before Supt. Minot, of the Erie Railroad started his plan for running trains by telegraph, this old Michigan Central line was doing the same thing in a very original and practical manner. In cases of delay and uncertainty it was a common thing for conductors and engineers to leave their trains at stations and go to the town telegraph offices, a mile or more distant, and, without help of dispatcher or superintendent, communicate with men in charge of other trains along the road and arrange to run without collision. M. D. Woodford, now president of the C. H. & D. R. R., John Thomas, one of the superintendents of the Penn. Road, and D. Wilmot Smith, a lawyer in Minnesota, were the men who organized the formal train-dispatching system of the road and made it for many years, the model system of the country. Under the superintendence of E. E. Torrey, it is now second to none. When the Western Union Company was organized, and went out to take possession of the Erie and Michigan lines, it found George W. Balch not only acting as manager of the Detroit office, but the owner of a large part of the stock of the company, which he had picked up at from $5 to $50 per share. He was persuaded to exchange his stock for twice the number of Western Union shares, and, for a number of years, was a prominent officer in that company. When the Bell telephone began its early whisperings, and when the chief officer of the Western Union Telegraph Company was emphatically declaring that it could *never* be made of any practical use, Mr. Balch quietly went to Washington and secured from Mr. Gardiner G. Hubbard an exclusive and perpetual franchise for the State of Michigan, and then went home and made a similar arrangement for the Edison and Gray telephones. He was never a very ambitious man, and so, after getting the business well established, he accepted an offer of a quarter of a million of dollars for its interest and retired in favor of W. A. Jackson, who had been one of his principal assistants in the telegraph business. Mr. F. A. Forbes is now the superintendent and the active managing man of the telephone company, and he is a good deal more than an agent of the American Bell Telephone

Company. His company has purchased a valuable lot on Washington avenue, and is arranging to erect a five story building on it. This will give them a more central location, enable them to consolidate the two city exchanges, and provide permanent quarters entirely under their own control. The company is operating 72 exchanges, and, by a system of intercommunication, has anticipated the long distance service to a large extent.

Quarters for the Coming Telephone Convention have been engaged at the Russell House, and a large attendance of delegates and interesting exhibits of apparatus are expected. Every facility for transacting the business of the convention will be provided. The city's magnificent river and island park, the St. Clair flats and the lakes beyond, afford opportunity for most delightful excursions, and, with Jackson and Forbes for hosts, if the boys do not have a good time it will be their own fault.

One of the Extensive Improvements of the city is a great union railway station, with an elevated road, which will occupy eight squares in the business part of the city. One of the large factories, which this improvement will remove, is the factory of the Detroit Electrical Company. This change, while it is a temporary annoyance, will prove to be a benefit, for the reason that the company's business has already outgrown its facilities. The business of the company, under the successful management of W. A. Jackson, has developed from a small shop for making binding-posts into a large manufactory of electric railroad equipments. The company is preparing to move into a new building, which is well under way and will be completed by the first of October. It is located on Woodward avenue, at the crossing of the Michigan Central, Lake Shore and Grand Trunk Railroads. It fronts 120 feet on Woodward avenue, with a depth of 157 feet; is three stories high, and contains 42,000 feet floor space. It will be supplied with new machinery of the most approved kind and will embrace ten departments. One entire floor will be devoted to the manufacture of insulated wire. One of the principal departments will be for the manufacture of electric street car motors and another for stationary motors, from one-half to 30 horse-power. Other features are electric light switches and appliances; magneto telephone bells and a great variety of electric sundries. The company makes a business of supplying electric outfits for street railways and, when required, takes contracts for constructing and putting in operation entire roads. It contemplates making mining machinery when the new factory gets running. The Rae system of street car motors is the one manufactured by this company and the work is done under the supervision of the inventor. The machinery of the street car trucks is simplified by the plan of using one motor which is geared to both axles. The armature speed never exceeds 1,000 and it is claimed that the motor is very efficient and almost noiseless. The company has a contract for equipping the Riverside Street Railway Company, at Fort Worth, Texas, with vestibule cars, 35 feet long on double trucks, each of which will have a 30 horse-power motor. These cars, which are being made by the Pullman Company, will seat 66 passengers and are designed to run 25 miles per hour. The road at Saginaw, Mich., equipped with the Rae system, is operating 18 cars very successfully. In this city, the Highland Park Railway, which originally used the Fisher center rail system, has just been changed to the Rae system. It is 3½ miles long, single track, and has three cars running. The Grosse Point Road, nine miles long, is being changed to the Rae system. These are the only electric roads in the city, except an experimental road with one Sprague car.

Not far from the New Factory of the Detroit Electrical Company, the Detroit Motor Company is erecting a building which is to be 50 by 100 feet, three stories high, and 50 by 250 feet, one story high. It will be ready for occupation in the course of the next six months. The company has been making a specialty of stationary motors, of various sizes, adapted to currents of 110, 220, 400 and 500 volts. When the new factory is completed it will commence the manufacture of street car motors. The business continues under the management of the secretary and treasurer, Mr. F. A. Blades, a gentleman of large business experience, and his son, Harry H. Blades, is the inventor and electrical expert of the establishment. This company is now building motors for the Jasper County Electric Light and Power Company, near Kansas City, Mo., which is to furnish power for a number of zinc mines in the neighborhood. Motors varying in size from two to 25 horse-power will be operated from one central station, and it is expected that an aggregate of 500 horse-power will, by reason of the readiness with which it can be distributed, displace 1,000 steam horse-power now in use. This zinc mining plant is being constructed by the Commercial Electric Company, of this city, of which Mr. Geo. E. Fisher is the exceedingly active manager. He has just concluded a contract for a central station lighting plant at Kalamazoo, Mich., to operate 1,200 lamps by the Slattery induction system.

A Very Busy Man is Mr. C. P. Gilbert, the secretary and manager of the Edison local lighting company. From his main station he is running 12,000 lights and 250 horse-power of motors. He is also experimenting with the Ward arc lamp on incandescent circuits. His sub-station is nearly completed, and will be opened shortly. It is located in the northern part of the city, and is calculated to supply a strip three-fourths of a mile wide by two miles long in the best residence district. It is equipped with one 100 horse-power Beck twin compound engine, one 150 horse-power Armington & Sims engine, two 900 light and two 1,600 light Edison dynamos. A new and important feature of this station is an arrangement of storage batteries which are to be used to meet the demand for lights between the hours of 11 P. M. and 12 noon. Two hundred and sixty cells of Pumpelly battery will be supplied for this purpose. Mr. Gilbert has undertaken this work for the purpose of determining, in a thoroughly practical manner, the value and the best means of using storage batteries in lighting.

The Brush Lighting Company is crowded with business. It has been running 1,000 incandescent lamps on arc circuits, but is just now changing these for the Westinghouse alternating system. This work will be commenced with two Westinghouse dynamos of 1,500 lights each, and two of 3,000 lights each. It is operating a large number of small motors on a 3,000 volt current. This company has followed the plan of retaining the ownership of the motors, and making a monthly charge for the current and the use of motors.

The Detroit Exposition Building and grounds, in which the annual fair will be held from August 26 to September 5, will be the most brilliantly lighted establishment in the country. The Detroit Brush Company has the contract for furnishing light and power from an independent plant. Three Ball engines will drive four Brush dynamos, each of 65 arc light capacity, and two Westinghouse dynamos, each of 300 incandescent light capacity. Twenty motors, of from one-eighth to four horse-power, will be distributed about the building. Mr. J. E. Lockwood is the electrical commissioner of the exposition. He still has the management of the Brush Company on his hands, and is also largely interested in preparations for the coming electric light convention at Cape May.

A Peculiar Feature in the landscape is made by the two sets of lighting towers. The Star Iron towers have been erected by the new company, which has the contract for public lighting, by the side of the Detroit towers belonging to the Brush Company, which are left standing for another chance to resume operations. The legal contest between the patentees of these two kinds of towers is much like the old case between the man who invented an envelope opener, consisting of a string projecting from the end of the envelope by which the latter could be jerked open, and the ingenious inventor who "improved" the plan by tieing a knot in the end of the string. The old towers stand firmly and comfortably on one central standard, while the new ones have four corner standards drawn closely together at the ground, in the attitude of a mule prepared to kick. The owners of the two systems occupy a similar position, and the judge before whom the question of patent rights is pending is taking three months to consider the point. Inasmuch as both inventions now belong to the Star Iron Tower Company, this fight is a local one. Mr. Lockwood's company holds the exclusive right to the Detroit tower for this city. The effect of the tower lights is very pleasing to a person unused to them, and their long-continued use, in localities where the streets are not solidly built up and the foliage is not too dense, has proven very satisfactory to the residents. The clusters of clear, white lights in the sky not only present a beautiful appearance, but the illumination of the surface of the earth is free from the disagreeable contrast of dazzling brightness and dense blackness sometimes caused by post lamps.

Respectfully Referred to Professor Abbe.—The government meteorological officer expresses the opinion, based on several years' experience, that the electric light towers exercise a powerful influence on the course and character of thunder storms. Before the erection of the towers, such storms commonly passed by the city and at some distance away, while they are now attracted to the city and greatly increased in severity.

Detroit has extensive and well equipped horse car lines, under the management of enterprising men, who recognize the justice of the public demand for greater carrying capacity and more rapid transit, as well as the fact that their own interest requires a change. A great many schemes are in the air, but none have yet materialized. The overhead electrical system is the only one that meets the situation with readiness and full preparation to do the work. Fortunately, the streets are generally wide, and the use of overhead wires will be less objectionable here than in many other cities. Legal questions as to the rights of the companies to change their motive power have arisen, and legislation will be needed to remove the difficulties. This is another case in which the laws of the States are adjusting themselves to the new order of things brought about by electrical developments.

Extensive Experiments with Storage Battery Cars have been made here with the customary failure to find the missing link between the ability to transport passengers and to pay dividends to stockholders. It is a significant fact, however, that repeated failures to demonstrate the success of this system do not discourage others from continuing the experiments. There is very evidently a growing opinion among street car men that it will be made a success.

The Car operated by Pumpelly batteries and Rae motors, which was exhibited on the roads here, has been sent to Middlesboro, Ky., for trial on roads in that town.

Detroit, Mich., Aug. 2, 1890. [G. C. M.

The Forest Lamp Hanger.

The Forest City Electric Works, Cleveland, O., is manufacturing a lamp hanger, which we illustrate on this page.

These hangers are adapted to be used with any system of electric lighting, either arc or incandescent, and in all places where it is necessary or desirable to lower lamps for the purpose of changing, renewing or trimming. The lamp is entirely supported by hook on the line wire supporting frame,

THE FOREST LAMP HANGER.

which engages with a steel pin in the hood, thus taking all strain off the raising and lowering cord.

When used to support a lamp over the street, the sheet steel hood is supported by cross wire or cable, and held in position by small wire or cord running to pole. This allows of readily placing lamp at any point over the street, and if it is desired to trim the lamp at one side of the street, as in case of wires interfering, the position cord can be released and the raising and lowering cord will draw entire hanger to one side of the street and release the lamp, which will then come straight down, and when trimmed can be pulled into engagement with the hood. The entire hanger with the lamp is then drawn along the cross wire to proper position over the street.

Electric Railway Work in St. Louis.

The greatest activity prevails here in reference to the electrical equipment of our street railway systems.

The Union Depot Street Railway Company's system has been in successful operation for the past three months, and the railway company have, I am informed, made two increases to their original installation.

The electric line across the Suspension Bridge, equipped with the Thomson-Houston apparatus, is the delight of all visitors to St. Louis—in fact, it has become one of the most attractive features of the city, and few strangers come here who do not take a ride in these cars across the bridge.

The Mound City Railway Company closed a contract several weeks ago with the Thomson-Houston Electric Company for the equipment of its entire system, and it is expected that this road will be in full operation in five or six weeks. Every effort is being made by the owners of this property to make this installation one of the finest in the country, and I understand that the Thomson-Houston Company are putting on some special features that will make their equipment in full harmony with the balance of the installation, which is to be furnished by the railway company.

The Thomson-Houston Electric Company have also closed a large contract here with the Missouri Railway Company for equipping their railway system with 36 electric cars, and this installation will, no doubt, compare favorably with all others which the Thomson-Houston Electric Company have made in this city. All of the overhead construction on the railway plants in St. Louis is supported by very shapely and substantial iron poles, placed upon either side of the street, and no criticism whatever is heard from our citizens affecting the unsightliness of this work. It is the general opinion here that it will not be many months before street railway cars, now being propelled by either horses or mules, will be a thing of the past. The electric system is welcomed with open arms by our enterprising people, and franchises authorizing and permitting the change from animal power to electricity are readily and cheerfully given by our municipal authorities.

B.

St. Louis, Mo., Aug. 10.

JEST FOR FUN.

Baking by electricity is the latest. Bread by this process ought to be very light—electric light, in fact.—*Plainfield, N. J., News.*

Gen. Slocum is striving to establish an electric railroad between Brooklyn and Coney Island. It is eminently proper that a Slocum road should be a quick going one.—*Chicago Times.*

Mistress—Bridget, I wouldn't hang the clothes on that electric wire. You may get shocked.

Bridget—Sure, mum, I've seen 'em all before.—*Munsey's Weekly.*

The electric light that has been guiding the citizens living in West Lawn and piloting the many beaux who find that beautiful suburb such an attractive spot these fine Summer evenings, is to be taken down. How cruel the city dads can be at times.—*Grand Island, Neb., Times.*

A Hint for the Fellows who Talk too Much at Convention.

Representative Cornbread: "Doctor, I wish ye'd give me some medicine."

Doctor: "What's the matter?"

Representative Cornbread: "I dunno; but every time I open my mouth, the Speaker tells me I'm out of order, an' I thought I might ez well hev it 'tended to."—*Washington Post.*

Whew!

We predict that within three years the motive power for plowing our large fields will be electricity. The horse for all work and cheap work has had his day. A storage battery no larger than a grip sack would drive a plow that would require six Percheron horses to pull.—*Denver Republican.*

A Large Supply House.

WHAT HAS BEEN ACCOMPLISHED IN THIS LINE IN THE CITY OF CHICAGO.

The illustrations accompanying this article give a good idea of the mammoth supply house of the Great Western Electric Supply Company, at 190 and 192 Fifth avenue, Chicago. This is a concern young in years, but having the benefit of the large experience of its projectors. Since the time of its organization, it has steadily grown until it is now in the front rank of supply houses

FIG. 2.—VIEW OF SHOW CASES AND DESKS.

The selection of a building for the Chicago house could hardly have been improved upon, both as to its location and as to the space, light and accessibility. Right in the middle of the block, between Monroe and Adams streets, the electrical signs and window display on a double front building will attract the attention of the many passers-by. The 42-foot front gives ample window space, where the borders of colored and opalescent glass shades, the assortment of switches, batteries and small motors, as well as some electric light and railway goods, may be shown to advantage. The five high stories, with large windows at the front and back, give light and airy floors and room for plenty of shelving. The location is one that makes it the most accessible of Chicago's electric houses from any of the depots. Besides, it is but a block from the other great electrical beehive, "The Rookery," but three blocks from the Chicago Electric Club. This, with the usual telegraph and telephone facilities, seems to make it convenient for everybody electrical.

THE INTERIOR.

On entering the store, any one of the number of novel features is apt to so catch one's eye that others of equal attractiveness may be passed by. To the left, near the door, is a large sample board setting off the brands of wire, as well as some of the choicest house goods. The double row of deep drawers extending along the south wall, is surmounted by some 400 pigeonholes, now mostly filled with small lots of the varied stock.

In front of these compartments is a line of some 50 feet of show cases, at present filled with station and linemen's tools, house goods and testing apparatus. The oak railing shown in the foreground gives a clear space for the managers of three departments and their assistants. The fan-motors shown on their desks give any desired amount of circulation, enabling the same work on hot as well as cool days. Above this enclosure hangs a large elk-head electrolier, consisting of three deer-heads, the tips of whose antlers are studded with incandescent lamps. A special form of attachment was devised for these, and the wires are practically concealed. Neat tinted shades add to the effect, which is as pleasing as it is novel. A good part of the ceiling has parallel iron pipes run lengthwise of the store, a few feet apart. From these the electric and combination fixtures are suspended. Here are fixtures varying from plain electric pendants to large chandeliers, and representing the finest American and European designs. Toward the farther corner a hundred brackets set against a dark background are shown to advantage. Here, too, are several new and handsome designs of fixtures for electric car lamps, to which but little attention has heretofore been paid.

Beneath the brackets are sliding racks for incandescent shades, arranged to show a large number in a small space. The partition in the background of the cut separates the store from the shipping room, which, like nearly every other part of the building, is fitted with shelves and bins for storing goods.

In the basement one meets with hundreds of reels of copper and galvanized iron wire, while one wall is lined with cross-arms of various sizes. In the farther corner is a long chute, lined with iron, down which the reels of wire try their experiments in rapid transit. At the same time the elevator can be used for taking wire up, thus making the receiving independent of the shipping department. Incandescent lamps light up the rear of the basement.

On the second floor are the offices of the company, of which our bird's-eye view shows a portion. They are conveniently arranged and handsomely finished in antique oak, with inlaid floors and chipped glass windows. The desks, cabinets and other furniture are all picked to give the greatest usefulness, and the originality of those interested has been given full play.

Our illustration shows a glimpse of the manager's office, adjoining which on the one hand is the stenographers' room, and on the other a private laboratory where tests of various kinds are made. To the right are the bookkeeping room and the purchasing agent's office, with the directors' room and the clerks' room in the background.

The rear of the same floor gives room for many hundred miles of wire, and also has a study fitted up for photographing the new designs of fixtures, shades, etc., brought out by the firm. Close by the stairs is another space devoted to shades and arc globes of all styles. The third and fourth floors are used for storing goods, plenty of shelving and drawers being provided. On the top floor is the repair shop, and here some of the company's specialties are put together. This shop, added to the out of town factories controlled by the firm, enables it to make its own specialties in any quantity.

As to the *personnel* of the new house, the manager, Mr. George Cutter, needs no introduction to our readers. His 20 years' experience in America and in Europe has given him a broad view of all electrical work, and enables him to judge well of the electrical supply line. He is assisted by Mr. H. Rea Hixon, who also acts as purchasing agent for the new firm. Mr. Charles G. Armstrong, well known from his connection with the New Haven Clock Company, and with the electrical work at the Auditorium, and for his numerous inventions, is at the head of the house goods department. Mr. Edwin R. Crolius, late of Sneider, Campbell & Company, has charge of the fixture department, while Mr. C. A. Robinson, buyer of the late Sprague Electric Equipment Company, takes special care of the railway supplies. Others, of equal experience, are directly or indirectly associated with the house, enabling every part of the work to be properly cared for.

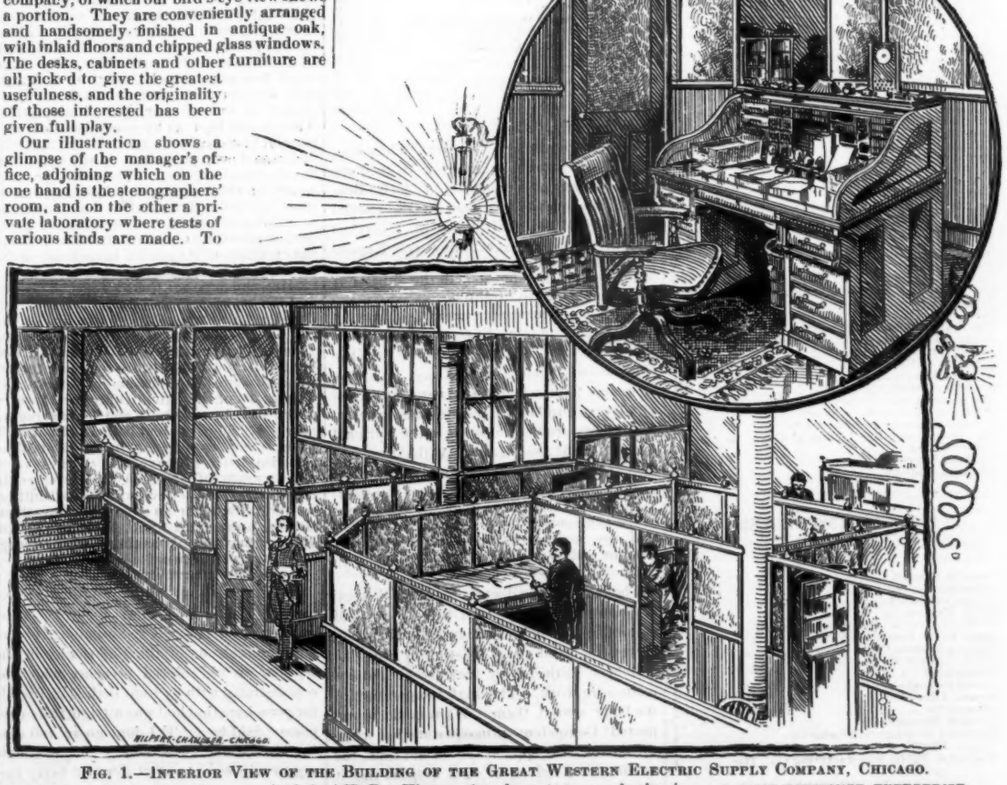

FIG. 1.—INTERIOR VIEW OF THE BUILDING OF THE GREAT WESTERN ELECTRIC SUPPLY COMPANY, CHICAGO.

A WIDE-HORIZONED ENTERPRIZE.

This is but one of the eight or more supply depots which the company expects to establish in various parts of the country. Arrangements have been made whereby several large factories will give the company their entire outputs.

Braddock, Pa.—The Braddock and McKeesport Electric Railway Company; capital, $100,000.

Hornellsville, N. Y.—The Steuben Electric Manufacturing Company; capital, $300,000; George E. Bronson, president; John Adsit, vice-president; Charles Adsit, treasurer.

Chicago, Ill.—Down Electric Company, to do general electrical construction work; capital stock, $10,000; incorporators, J. A. McEntee, F. P. Williams and John M. Glenn.

McKeesport, Pa.—The Enterprise Light, Power and Heat Company, will capitalize at $100,000, and will build a brick plant at Reynoldton. The officers are, J. E. White, president; Thomas Reynolds, treasurer; L. G. Reiber, secretary; H. H. Swaney, solicitor.

Alpena, Mich.—The Alpena Street Railway Company has been organized with the following officers: President, E. O. Avery; vice-president, John Monaghan; secretary, C. E. Williams; treasurer, B. C. Morse. The company propose to lay two miles of track this Fall, and it is probable that electric power will be used.

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CONTENTS.

PAGE.

The New "National" Direct Current Machine.. 1
Is There Platinum in Mexico?..... 1
Maynard in Detroit..... 1
The Forest Lamp Hanger..... 2
Electric Railway Work in St. Louis..... 2
Jest For Fun..... 2
A Large Supply House..... 3
Repeal the Electrical Execution Law..... 4
The Electrical Census..... 4
Cable Disturbances..... 4
A Course in Electrical Reading..... 4
At Cape May..... 4
Observations on Currents Originating in Ordinary Aerial Telegraph Conductors..... 5
Telephone Company Loses..... 6
The Clam Bake..... 6
Lightning Not Always Comes From the Clouds. 6
A Great Wire Factory..... 6
Letters By The Electrical Route..... 7
Electricity and Etching..... 7
Damages For A Shock..... 7
Tore Down The Depot..... 7
A Newspaper Story..... 7
North American's Plans..... 7
An Electric Automaton..... 8
A New Rosette Cut-Out..... 8
Book Notices..... 8
Financial..... 8
On The Wing..... 8
Electric Clubs..... 9
Telegraph Company Sold..... 9
The First Atlantic Cable Signals..... 9
Another For Brush..... 9
Personal..... 9
The Bryant Electric Company..... 9
Another English Criticism of Electrocution.... 9
A Westinghouse Strike..... 9
A New Wall Bracket..... 9
Rules and Regulations..... 10
Sessions Foundry Company..... 11
The South Wants the Electric Light..... 11
What are "Bell Steel" Gongs..... 11
Subway Company Not Enjoined..... 11
The People and the Electrical Chair at the Eden Musee..... 11
Kindred Interests..... 12
Electrical Patents..... 12

INDEX OF ADVERTISERS.

COVER PAGES.

PAGE.

Ansonia Brass & Copper Co..... 4
Armington & Sims..... 4
Bridgeport Brass Co..... 4
Brush Electric Co..... 3
Davis, Charles H., Electrical Engineer..... 4
Day's Kerite Insulated Wires..... 4
Eastern Electric Cable Co..... 4
Great Western Electric Supply Co..... 2
Hampson & Co., E. P..... 4
Jewell Belting Co..... 4
Moore, Alfred F..... 4
Okonite Co..... 4
Simplex Electrical Co..... 4
Standard Underground Cable Co..... 4
Tucker Electrical Construction Co..... 4
Wilmot & Hobbs Manufacturing Co., The..... 4

INSIDE PAGES.

Aluminum Battery Electric Light & Power Co.. 18
American Bell Telephone Co..... 19
American Circular Loom Co..... 14
American Electrical Works..... 18
Baker & Co..... 18
Ball Electric Light Co..... 19
Baxter, H. E. & C..... 27
Boston Rubber Shoe Co..... 13, 18 & 25
Boston Woven Hose Co..... 22
Brownlee & Co..... 25
Bryant Electric Co..... 25
Buckeye Engine Co..... 16
Burton Electric Co..... 19
Butler Hard Rubber Co..... 30
Cary & Moen..... 24
"C. & C." Electric Motor Co..... 14
Central Electric Co..... 21
Chadbourne, Haselton & Co..... 18
Clark Electric Co..... 23
Columbia National Bank..... 11
Connecticut Motor Co..... 27
Crocker-Wheeler Motor Co..... 33
Day, A. G..... 20
Dwight Slate Machine Co..... 24
Eddy Electric Manufacturing Co..... 25
Edison General Electric Co..... 15 & 19
Edison Lamp Co..... 23
Edison Manufacturing Co..... 20
Electric Merchandise Co..... 22
Elektron Manufacturing Co..... 14
Empire China Works..... 19
Empire City Electric Co..... 33
Eugene F. Phillips Electrical Works, Ltd..... 17
Eureka Tempered Copper Co..... 27
Evans Friction Cone Co..... 14
Faraday Carbon Co..... 24
Forest City Electric Works..... 23 & 24
Fort Wayne Electric Co..... 32
Freeman, Walter K..... 25
Garvin Machine Co..... 16
Gibson Gas Fixture Works..... 18
Gleason M'f'g Co., E. P..... 17
Gordon & Co., W. H..... 13
Greeley & Co., The E. S..... 13 & 22
Hazazer & Stanley..... 23
Heine Safety Boiler Co..... 22
Holmes, Booth & Haydens..... 21
Holtzer-Cabot Electric Co..... 19
Horn, Brannen & Forsythe Manufacturing Co.. 18
Illinois Electric Material Co..... 25
Interior Conduit & Insulation Co..... 30
Lane & Bodley Co..... 24
Leclanche Battery Co..... 18
Leffel & Co., James..... 24
Lehigh Valley Creosoting Co..... 18
Macfarlane & Co., Wm..... 16
Maguire, F. Z..... 11
Manufacturer..... 11
Manufacturers' Advertising Bureau..... 19
Marshall, Wm..... 11
Messner, C. W..... 11
Mitchell Vance Co., The..... 23
National Carbon Co..... 19
National Pipe Bending Co..... 27
Newark Machine Tool Works..... 18
New England Butt Co..... 16
New York Belting and Packing Co..... 24
Ostrander & Co., W. R..... 18
Paillard Non-Magnetic Watch Co..... 18
Palermo Mica Co..... 16
Parker-Russell Mining and Manufacturing Co.. 1
Phœnix Glass Co..... 18
Phosphor-Bronze Smelting Co., Ltd..... 19
Pond Engineering Co..... 16
Queen & Co., James W..... 18
Rice Automatic Engine..... 16
River and Rail Electric Light Co..... 17
Roebling's Sons Co., John A..... 23
Royce & Marean..... 24
Sawyer-Man Electric Co..... 29
Schuyler Electric Co..... 18
Seely & Taylor Manufacturing Co..... 22
Shultz Belting Co..... 22
Solar Carbon & Manufacturing Co..... 13
Southern Electrical Supply Co..... 14
Sperry Electric Co..... 18
St. Louis Electrical Supply Co..... 23
Stevens & Babcock..... 32
Thomson-Houston Electric Co..... 28
Trinidad-Helmann Insulated Wire Co..... 19
Tropical American Telephone Co..... 30
United Electric Traction Co..... 21
U. S. Electric Lighting Co..... 31
Vincent & Co., Charles R..... 16
Wainwright Manufacturing Co..... 32
Walker Electric Co..... 16
Washburn & Moen Manufacturing Co..... 24
Washington Loan & Trust Co..... 11
Washington Electric Conduit Co..... 11
Watson & Stillman..... 13
Western Electric Co..... 24
Western Power Construction Co..... 17
Williams & Potter..... 16
Wyckoff Pipe Co..... 18

We present this week a very interesting article on currents originating in ordinary aerial telegraph conductors, by A. E. Bennett. The paper was read at the special meeting of the Institution of Electrical Engineers, held at the Edinburgh Exposition in July, and we think American readers will be as much interested in the subject as were their English brethren.

This issue of the ELECTRICAL REVIEW will reach Cape May just about the time the Convention is under full headway. We hope to be able to give in our next issue the names of a larger number of people than have attended any previous meeting of the National Electric Light Association. At that time will also appear the proceedings and papers read at the Convention. Two or more representatives of the REVIEW will be in attendance at the Convention during the entire session, and any service that can be rendered our patrons and others will be a pleasure.

The fears of the doctors to begin dissecting Kemmler's body until three hours had elapsed, shows pretty conclusively that they feared the baking and roasting to which he had been subjected by the current had not made sure work. The high temperature of the body scared them. What could be expected? Competent witnesses state that when the current was applied the second time, the machine was driven at such a speed that it fairly leaped from the floor. With such an enormous volume of current as must have been generated, it would require a very few minutes to bring the blood to boiling point. Gerry and his co-adjutors can give the Cannibals odds on furnishing a human roast.

REPEAL THE ELECTRICAL EXECUTION LAW.

It is to be hoped that the sickening results of the Kemmler killing will lead to the repeal of the electrical execution law. Just in the wake of this horrible affair it is but natural that considerable discussion regarding the death penalty should be indulged in. Whether the "life for a life" principle be abolished or not, it is certain that electrocution too nearly approaches the methods of the Inquisition to be at all compatible with our modern ideas of civilization.

There is, of course, a great deal of false sympathy for murderers indulged in by sentimental men and women. The delays of the courts are in a great measure responsible for the growth of this feeling. "Witness the fact that in this country, between 1884 and 1889, there were 14,779 murders committed and only 558 of the murderers were legally executed. We are inclined to believe with Blackstone, that "it is not the severity but the certainty of the punishment" which is the true reformatory agent.

THE ELECTRICAL CENSUS.

In accordance with resolutions passed at the Eleventh Convention of the National Electric Light Association, held in Kansas City, last February, a memorial favoring the authorization of a special census investigation of the electrical industry, and an appropriation of $50,000 to provide for the same, has been prepared. It was presented in the Senate by Mr. Hale, on August 5th, and referred to the committee on the census.

Every man interested, in the slightest degree, in the electrical field or its tributary industries realizes the need and importance of such a work. It is earnestly hoped that our law-makers may view the matter in the same light.

We quote from the memorial:

"By means of the census reports, it is the purpose of the government to establish the rightful rank of the United States among the nations of the world in points of population, wealth, education and general progress in the industries, arts and sciences. The development of the older nations is the resultant of the accumulations of centuries. The development of the United States is the resultant of the genius, enterprise and intelligence of its people. While we yield respect to the Old World, or its histories, in the practical sphere of commerce, we daily demand and receive tribute from all nations for the genius of our inventors and the skill of our artisans. It is our duty to lay claim to all honors to which American inventors and artisans are clearly entitled for their genius of invention or skill of adaptation. This should be done by concise and circumstantial historical statements in the first official report ever published by any nation on the electrical industry. The proud pre-eminence of this country in these respects is most marked. There is not a nation in the world that is making use of the many practical applications of electricity without using the creations of American inventions or the products of American factories.

"How much reason there is for such claims, and the broad field they cover, will be readily understood when it is known that of the 205,479 patents issued by the United States Patent Office for the 10 years ending December 31, 1889, 12,591 pertain to apparatus for some practical application of electricity. The profits of the Patent Office for those 10 years has been $2,210,863.76, averaging nearly $10.76 per patent issued. Upon this basis, inventors working in the field of the electrical industry, have paid to the government a profit of $135,473.62; therefore, in requesting that the government shall authorize and provide for an exhaustive investigation of, and report upon, the electrical industry, they are only asking a fitting recognition from their beneficiary."

The agitation of these awfully tender hearted people who think the rope is too terrible an instrument to dispatch murders with, reminds us of the philosophy in the reply of an old colored preacher who was remonstrated with by some orthodox friends for preaching that hell was a frightfully cold place. Said he: "'F I done go an' tell dese sinnahs dat hell's hot, ebbery ol' rheumatic nigger will want to start dere de berry fust fros'."

Our humanitarian friends would like to make death so easy that felons will clamour for a chance to be dispatched. They have certainly selected the wrong weapon in using the electric current.

CABLE DISTURBANCES.

The cable receiving apparatus of the Commercial Cable Company has recently been subject to some disturbing influence. This disturbance is attributed by Mr. Chas. Cuttriss, electrician of the Cable Company, to the inductive influence of an electric railway circuit. The cable lands at Coney Island, and an underground conductor connects it with the offices in Wall street, by way of Ocean avenue and Brooklyn. The railway circuit extends between Prospect Park, Brooklyn, and Coney Island, and its nearest point is about half a mile from the cooler circuit. It might lead to some safe conclusion as to whether the railway circuit is responsible for the change, if a shunt wire extending around the field of disturbance, *i. e.*, around the railway circuit, be connected to the underground cable conductor. Any induced currents developed in the cable would thus be provided with a short circuit and would not, of course, discharge through the main cable circuit and vary the signaling currents. A patent was issued a short time ago covering this idea, and was specially designed to protect telephone circuits.

A COURSE IN ELECTRICAL READING.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you kindly outline in the REVIEW a complete series of reading for persons interested in the study of electricity? By so doing, you will oblige many readers of your valuable paper. SUBSCRIBER.

Detroit, July 28.

It would be impracticable to cite a short list of books suitable for all students. The field of study would be governed by the extent of reading already pursued and the reader's degree of familiarity with the art. The list of text-books published in the REVIEW gives a wide range of selection, the titles giving a fair idea of the contents. We think our correspondent, by carefully examining it, will be able to make a judicious selection.

AT CAPE MAY.

GETTING TOGETHER FOR THE ELECTRIC LIGHT CONVENTION.

CAPE MAY, N. J., August 18, 1890.—The spacious corridors and verandas of the Stockton Hotel are rapidly showing the advent of the electrical horde which is to take this place by storm to-morrow. The officers have nearly all arrived, and these, together with the party which left New York on Saturday, have already had a taste of the pleasures of this pleasant place. Many brought their families and friends, and those who didn't are sorry for it now. Present indications point to a large influx of electricians on the train from New York, due here this evening. These are the officers:

President, Marsden J. Perry.

First Vice-President, E. A. Maher; Second Vice-President, C. L. Edgar.

Secretary and Treasurer, Allen R. Foote.

Executive Committee—C. R. Huntley, Chairman; J. J. Burleigh, M. J. Francisco, John A. Seely, E. R. Weeks, James English, A. F. Mason, H. K. Thurber, C. H. Wilmerding.

Committee on Entertainment—F. Theo. Walton, Chairman; A. J. De Camp, J. J. Burleigh, John A. Seely, Allen R. Foote.

The special which carried the electrical party, left New York at 1.50 P. M. Saturday and arrived here at 6.30 in the evening. It was a jolly crowd and enjoyed the trip. The following is a list of those in the party: Gen. O. E. Madden, J. C. Chamberlain, Dr. Geo. Austin, C. W. Price, H. A. Boughton, wife and child; Miss Moran, S. E. Barton, wife and daughter; C. O. Baker, Jr., and wife, Gen. C. H. Barney and wife, Capt. Willard L. Candee and wife, T. C. McCoubray, J. W. Godfrey, H. L. Shippey, F. A. Perrine, J. P. McQuaide and wife, John A. Seely and wife, M. J. Francisco, wife and daughter; President Marsden J. Perry, wife and friends; E. H. Stevens.

Several joined the train *en route*, among these being Senator Fred W. Royce, of Washington, D. C., who flagged the train near Camden.

Observations on Currents Originating in Ordinary Aerial Telegraph Conductors.

BY A. R. BENNETT, M.I.E.E., READ AT THE SPECIAL MEETING OF THE INSTITUTION OF ELECTRICAL ENGINEERS, HELD AT THE EDINBURGH INTERNATIONAL EXHIBITION, JULY 15, 1890.

All users of telephones connected by single wires are familiar with the variety of noises which are generally present, even when the line is only a few hundred yards long. It is exceptional to find a wire which can be said to be even approximately silent at all times. The origins of some of the foreign currents which the presence of these noises indicates, have been explained by Preece, Lockwood and others. Recently in testing some overhead copper and iron wires run on the same poles for capacity by charge and discharge, using a sensitive reflecting galvanometer, the author noticed the presence of currents which could not be accounted for by any of the known explanations, and the causes of which he determined to investigate.

It was noticed that soon after the commencement of rain, a steady current appeared on all the wires under test. The deflections increased as the rain continued, until, after the thorough soaking consequent on several day's wet, they were in some case no longer within range of the scale. A constant discrepancy in the behavior of copper and iron wires was apparent. The deflections from the copper were always positive, while those from the iron were always negative, and invariably much feebler, seldom exceeding one-third the strength of the positive ones.

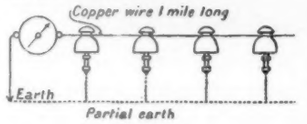


FIG. 1.

To ascertain the cause, two wires, one No. 12½ copper and the other No. 11 galvanized iron, run side by side on the same arms for a distance of a mile (Fig. 4), were taken. In fine weather the insulation resistance of each was infinite.

When disconnected at the further ends and earthed at the home end through the reflecting galvanometer (Fig. 1.), they always in wet weather exhibited the phenomena described.

The following are extracts from the records of tests, extending over several months, during medium and heavy rain:

Copper. (always positive.)		Iron (always negative.)	
Degrees	Value of deflections in milliamperes.	Degrees	Value of deflections in milliamperes.
4.5	.0030375	1.5	.0010125
13.0	.008775	3.75	.00253125
20.5	.0138375	4.0	.002700
17.0	.011475	3.0	.0020925
15.0	.010125	4.5	.0030375
3.0	.000925	17.5	.0003375
46.0	.031050	17.5	.0118125
22.0	.014850	7.0	.004725
14.5	.0097875	3.5	.00236c5

It will be observed that the copper deflections were always from three to six times stronger than iron ones. When the copper

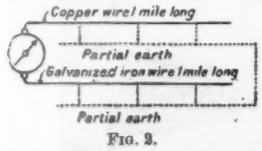


FIG. 2.

and iron were left insulated at their distant ends, and looped at the galvanometer (Fig. 2), earth being excluded, the positive and negative deflections were always equal. Thus, taking the last three of the foregoing tests, when looped 46 + 17.5— became 35 + 35—; 22 + 7— became 12.5 + 12.5—; 14.5 + 3.5— became 9.7 + 9.7—.

Half-a-dozen insulators, with galvanized iron bolts, were mounted on an arm in the testing room, and thoroughly wetted (Fig. 3). With a copper wire run on them, and the bolts connected as shown, a positive current appeared as soon as the film of water was established between the wire and the bolt. With an iron wire instead of the copper, no current appeared. The positive current, therefore, seemed to be due to voltaic action between the copper wire on the insulators and the galvanized iron bolts supporting them when connected with the moist surface. The course of the current can be traced in Fig. 1. The wire and insulator bolts form a series of voltaic cells joined in parallel.

The absence of a current from the iron when mounted on the experimental arm con-

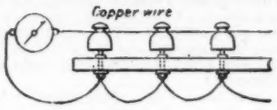


FIG. 3.

firmed this conclusion, since no current was to be expected under the conditions. But whence then the negative current from the iron wire run on the actual poles? In that case it had a copper wire strung alongside it (Fig. 4). The wetting of both insulators established the connection necessary for electrolytic conduction between them, so that the metals constituted a voltaic couple, the negative current from which appeared on the iron.

The positive current on the copper was consequently due to the copper wire acting with the iron bolts of its own insulators, the iron bolts of the neighboring insulators and the iron wire which they supported.

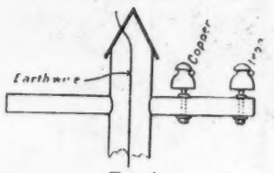


FIG. 4.

The negative current on the iron was due to the iron wire, its bolts and the bolts of the neighboring insulators acting with the copper wire. But the bolts of the insulators (Fig. 4) were partially earthed by the damp wood of the poles and the earth wires which ran down them. If the earth had been perfect, no current could have got to the galvanometer, but since it was only partial some found its way by that route; and so the difference in strength between the positive and negative currents is accounted for.

The positive, depending chiefly on the action between the copper wire and its own bolts, between which no earth intervenes, is necessarily stronger than the negative, which depends wholly on the action between the iron wire and bolts and the copper wire, between which a partial earth is interposed (Fig. 5). So when the earth is cut off from the galvanometer (Fig. 2), the effect of the earth between the two plates is neutralized, and the positive and negative deflections become equal.

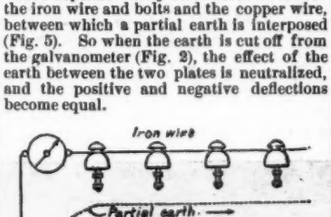


FIG. 5.

A somewhat unexpected effect of the recent introduction of copper wires for telegraph and telephone purposes is consequently the establishment over the country of a vast number of voltaic couples, which only become operative in damp or wet weather.

The zinc of the bolts of insulators carrying copper and bronze wires may reasonably be expected to disappear sooner than in days gone by, when only iron wire was used; and when copper and iron wires are run on the same poles, the galvanizing of the iron must suffer sooner than of yore.

The Americans, with their wooden pins, will escape the currents due to the difference of metal between the wire and its supports; but when they mix wires of different metals on the same poles the resulting action will be stronger than with us, since they do not earth-wire their posts. Telephonically, the existence of these currents is of little moment. With metallic loops, when both wires are of the same metal, they will not matter at all, since the currents from two similar wires will be in the same direction and of the same strength, and, meeting in the telephone or translator, will neutralize one another.

On single wires, so long as the currents remain steady, their presence does not matter much. As they increase gradually as the insulators become wet, and die away slowly as they dry, they do not give rise to any disturbance in the telephone. If any confirmation of the voltaic origin of these currents were needed, it would be afforded in the fact that it is possible, by charging the line from a battery, to polarize the line couple even to the extent of obtaining temporary currents of the opposite sign. Thus, the copper was repeatedly charged from a 90-volt battery; when from the positive pole the line current was increased, when from the negative the line current was decreased and sometimes reversed.

The following are particulars of several tests of the copper wire, the deflections being in degrees:

Charging wire from 90 volts, — to line, so as to neutralize and overcome line current:

Line Current.	Duration of Charge.	Result.
.5+	10 seconds.	Reversed to .2—
6°+	20 "	Reduced to 5.0+
8.4+	4 minutes.	" 3.5+
12.5+	10 seconds.	Reversed to .2—
12.5+	Spot went back instantly to .5+, and then recovered slowly to 12.5+. 30 seconds.	Reversed to .4—
12.5+	Went back quickly at first, and then slowly recovered to 12.5+ in 45 seconds. 1 minute.	Reversed to .8—
12.5+	Went back instantly to 3.5+, recovering slowly to 12.5+ in 70 seconds. 2 minutes.	Same as 1 min.
12.5+	3 "	" "

The same effects were produced with the experimental arm. With only one insulator, reversed, the cup being full of water and the surface well wetted, a deflection was got of 4deg., equal to .0027 milliamperes. When the current from this insulator was reduced to .2+ through the surface drying, a reversal could always be obtained to .4—, and sometimes to 6.—, by charging it from 90 volts.

During the capacity tests already mentioned, it was observed that for some time after the commencement of rain, the apparent capacity of the wire invariably arose instead of falling with the decrease of insulation. This effect has, of course, been noticed before; but as the author was not aware that it had been satisfactorily accounted for, it was resolved to investigate, and the result of the investigation seems to point to several contributory causes. Firstly, no doubt, the line current due to the voltaic action already described will increase or diminish the discharge, according to the direction of the charging current. Secondly, the polarization of the bolts due to the charging current will have the same tendency. But the capacity of the line will appear too high when the moisture on the insulators is too slight to permit of voltaic action. To seek the cause of this, 12 feet of copper wire was run on six dry insulators, fixed in oaken arms in the test room. With 90 volts the wire gave a discharge of 4 deg. The tops of the insulators around the binding wire were wiped with a wet sponge. The discharge then rose to 1 deg. more than double. Wetting more of the surface of the insulators resulted in a still further increase. Several discharges could be got without renewing the battery charge. It would, therefore, appear that wetting the insulators is equivalent to an increase of conductor surface. The moisture has to be charged as well as the wire, and the consequent discharge is greater than with a dry wire. The effect is only observable in moderate rain or for some little time after the commencement of heavy rain. When the insulators become thoroughly wet, the insulation and the capacity fall together, and then the voltaic action and polarization come into play, together with another phenomenon which has not yet been referred to.

Incidentally, in the course of these tests, it was found that when a wire is in contact with moist wood, and is charged from a powerful battery (90 volts were used), the discharge is several times stronger then when the same wire is supported on dry or partially moist insulators. Thus a length of wire on insulators gave a discharge of .9 deg.; when stapled along an oaken arm not sensibly damp, the discharges, after 20 sec. charge, amounted to 4.5 deg., and after 80 sec., to .5 deg. Then a residual charge appeared to remain in the wood, as the wire continued to yield a current of .5 deg. for some minutes, then gradually dying away to nothing. Many tests, varied in details, gave the same results; 30 feet of wire in air

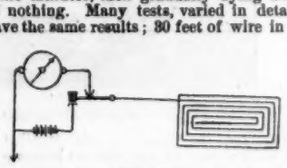


FIG. 6.

gave a discharge of .4 deg. When the same wire was stapled on a deal board (Fig. 6), not sensibly damp, with staples of the same metal as the wire, the discharge became 3.5 deg., falling immediately to 1 deg., and then slowly to zero. The wire and the wood were then sponged, and the discharge rose to 7 deg., falling immediately to 2 deg., and returning slowly to zero. The wire yielded a series of smaller discharges for several minutes without any fresh contact with the battery. A deal box wetted, having some bronze wire in contact with it, was well insulated by being suspended by G. P. Charged for 20 sec. from 90 volts, it gave a discharge of 1.6 deg., sinking immediately to .8 deg., and then gradually to zero. The same box standing on the floor, gave a discharge, under the same conditions, of 12 deg., sinking to 3 degrees, and then slowly to zero. The same box, touched by the end of an earth wire—also of bronze—well away from the bronze wire, gave a discharge of 45 degrees, sinking immediately to 26 degrees, and thereafter slowly to zero. In the two first cases only one metallic conductor, that is to say, the bronze, through which the charge was communicated, was present, and the source of the return current is not very apparent.

The last case closely resembles that of a wet telegraph pole, the earth-wire of which does not touch the bolts. Then an expanse of wet wood intervenes between the bolts and the earth, and a powerful charging current in the line must, with leaky insulators, result in back currents. As it is evident that moisture in wood has the effect of increasing the capacity, it may not be unreasonable to deduce that moisture in the air surrounding the wire may have the same effect.*

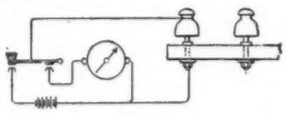


FIG. 7A.

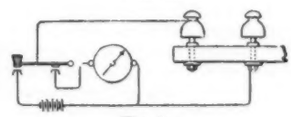


FIG. 7B.

The foregoing particulars apply, whether the line is of copper or of iron. The following observation applies to iron alone. It has been mentioned that no current between a galvanized iron wire on a wet insulator and the bolt could be detected. But if such a wire is charged by 90 volts, the discharge is followed by a counter-current from the insulator. The effect can be produced with a few inches of galvanized iron wire and a wet insulator, as in A, Fig. 7. Charging such an arrangement by 90 volts yielded a discharge of .4 degrees and a counter current of .3 degrees, which did not wholly disappear for some three minutes. Obviously, the polarization of the bolt following on electrolysis of the moisture made the insulator a secondary battery. The effect of damp wood may be markedly shown by shifting the return wire to the bolt of an adjoining insulator, as in B, Fig. 7. The discharge then become 1.5 degrees and the counter current 1 degree, an augmentation of nearly four times. Connecting the earth-wire direct to the bolts will obviate the effect of moist wood, but it increases the strength of the voltaic action and the polarization of bolts by the charging current.

Although the Americans escape the voltaic action consequent on the use of metallic bolts, the damp wood of their poles cannot be without its effect in wet weather with the insulators they use.

The current set up between copper wire and iron bolts in wet weather might be used to signal with. The experiment has not

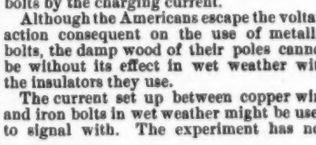


FIG. 8.

been tried; but it seems plain that a galvanometer at A, Fig. 8, through which the line current circulates in its full strength when the wire is insulated at B, would be affected by the working of a key between the line and earth at B; for the key, when closed, would shunt a large proportion of the current away from the galvanometer.

It will be observed that these experiments were made with the distant ends insulated—a condition which does not obtain in ordinary telegraphy. The practical effect of the disturbances noted may be insignificant, especially with the double current working, but still it is well to know that they exist.

* NOTE.—Since reading the paper it has occurred to the author that the probability of this conclusion is strengthened by considering that dry and moist air have very different capacities for heat. Tyndall found that the absorption of heat by dry air being 1, that of the air of his laboratory, not specially damp, was 72, while that of air designedly moistened was no less than 90. Thermal and electrical vibrations differ only in frequency, so that some common absorptive action in respect to air may be looked for. The heat absorbed by the moisture in the air is, after the withdrawal of the source of heat, radiated or discharged, not instantly, but gradually; just as the electrical charge, after the cutting off of the battery, is parted with slowly and by degrees, as indicated by the residual charge. It may be expected, therefore, that the apparent capacity of a conductor will be least when contained in artificially dried air.

Telephonic News

*** Upper Sandusky, O., wants a telephone system.

*** The Terre Haute, Ind., Telephone Company has made preparations to completely rebuild its lines.

*** The wire to be used for the telephone line between Paris and London is made of phosphor-bronze. It is estimated that the French share of the expense of establishing the telephone will be about $150,000. Enthusiasts believe that all the telegraphic communication will be superseded.

Telephone Company Loses.

A decision was reached at Albany on August 8th in the action of the Hudson River Telephone Company against the Watervliet Turnpike and Railroad Company which has created considerable interest. The action was for a permanent injunction to restrain the railway company from operating its cars by single trolley electrical system, and for the damage to its business. Referee Lawson holds that the telephone company has no case, and accordingly dismisses it. The railroad company has been restrained by temporary injunction from operating its cars pending the suit and will now bring action for damages.

The Clam Bake.

The American Electrical Works, Providence, have issued the invitations to the twelfth annual Rhode Island clam dinner, to be given at the Vue de l'Eau Club, on Saturday, August 23d. Lunch will be spread at 11.30 A. M.; the bake—and the clams—will open at 3 P. M.

The reception committee is as follows: Marsden J. Perry, Providence; J. J. Carty, New York; Henry B. Cram, Boston; John I. Sabin, San Francisco; E. B. Baker, New Haven; and W. H. Sawyer, Providence. With these well known electrical gentlemen to receive, and Mr. Eugene F. Phillips to welcome, as host, it will be worth going miles to be present at that dinner.

Lightning Not Always from the Clouds.

During the progress of the electrical storms of July 8th, in this State, it was noted in several places that electrical discharges passed from the earth to the clouds, as well as from the clouds to the earth. The *Post-Express* described this phenomenon as observed at Irondequoit Bay. A gentleman who recently returned from the Adirondacks observed the same electrical action. Discharges passed from the hills across Star Lake to the clouds, and from the clouds to the hills. Similar observations were made in this city in 1885 or 1886. Preceding and during the volcanic eruptions in New Zealand, June 11th, 1886, electric fire balls or meteors were observed to pass from the earth. These electrical discharges were from regions considerably removed from the volcanic craters.

It has been urged that the eye cannot detect the direction of a lightning flash, and that the passage of a discharge from the earth to the sky is only apparent, an optical illusion. This objection is employed mainly to support a theory that the passage is always from the sky to the earth. If the reasoning of the objection be correct, what is there to support the theory that the passage is always from the sky to the earth? The statement that discharges are invariably from the sky to the earth is based on observation, and has no other basis. An object on the earth may be shattered by a bolt passing from the earth to the sky as well as by passage from sky to earth. The shattering force is shown when the fluid passes from one medium to another. The testimony of sight must be accepted in case of apparent passage of the bolt from earth to sky if it is accepted in the passage from sky to earth.—*Rochester, N. Y., Democrat.*

A Great Wire Factory.

THE OKONITE COMPANY'S PLANT AT PASSAIC, N. J.

The International Okonite Company is the result of the first venture of English capital into American electrical circles. The union of the Okonite Company, of New York city, and the large wire manufacturing house of Shaw & Connelly, Manchester, England, has already been mentioned at length in these columns and is now a matter of history.

The plant of Messrs. Shaw & Connelly is being fitted up as rapidly as possible with the peculiar machinery necessary to the manufacture of Okonite wire. As soon as this is done the wire will be made both in England and at the American plant, in Passaic, N. J. It is with the latter that we are concerned.

With Mr. George T. Manson, of the Okonite Company, as cicerone, a representative of the ELECTRICAL REVIEW recently made an excursion to the Passaic factory. After a ride of 12½ miles on the main line of the Erie Railroad, Passaic was reached. From the station the Okonite factory is accessible in three ways; you can travel on foot, in an electric car run on the overhead system, or in a Jersey "hack." It is but a short distance in any case.

Situated on the banks of the Dundee Canal, with a spur of the railroad running right up to the door, the main building stretches away in a vista for 380 feet. It is 60 feet wide, with a wing 50×120 feet, and a boiler house, 80×50 feet, adjoining. All the buildings are three stories high. In addition, there are carpenter, machine and blacksmith shops on the premises, the whole group of buildings covering about six acres. Over 400 hands are employed, turning out about 60 miles of insulated wire per day. And yet these facilities are inadequate, an extension of the plant, in the near future, being contemplated.

Water-power, derived from the canal, is used to drive the machinery. If, for any reason, this should fail, a 250 horse-power engine is always ready for service. Oil is used for fuel and a saving of 30 cents per day over coal is effected. The oil fuel apparatus is not entirely completed. When it is finished, a larger saving will be made. A 50 horse-power Thomson-Houston incandescant dynamo furnishes illumination for the various buildings. The establishment is under the supervision of Mr. F. Cazenove Jones, with Chris. Klotzbach as assistant superintendent.

Let us follow a coil of bare copper wire from the time it enters the building till it emerges, still a coil of wire but insulated with Okonite compound. As the bare wire is received it is uncoiled and run through a series of pulley wheels to stretch it and take out the kinks. These coils are then welded into any desired lengths. Two Thomson electric welding machines are employed for this purpose. The wire is now tinned by being run through a crucible of hot tin alloyed with a little lead. As it comes out of the tin bath it passes through several bunches of asbestos and grease, and then is drawn a considerable distance through the air to cool it before it is wound on reels. All sizes of wire, from the heaviest down to No. 30, are treated in the same way. In the meantime, the Okonite compound has been prepared and calendared upon thin sheets of tin. These sheets are cut into strips about 160 feet long, varying from three-quarters of an inch to two inches in width, and wound upon reels. A wire and a length of the compound, spread on the tin, are now fed into a covering machine (see Fig. 1), the wire running on pulleys overhead and the strips of compound being carried across a steam plate, the heat from which softens the compound in a slight degree. After passing through the ingenious covering machine, the wire emerges looking like a flexible tin rod with a raised seam on one side.

Now the wire is wound on large steel drums, which are rolled into the vulcanizers. Here is where the tin covering comes into service, as it prevents the compound from swelling or being injured under the 95 pounds of steam pressure and the 290° of heat which are employed in the vulcanizing process. The drums are rolled out, and the wires again wound on reels, which are carried to the ends of long steam pipes. The wire is run through to soften up the compound a little so that the tin covering will separate easily, and as it comes out it is caught in another machine which is attended by a boy. With a little wooden tool he presses apart the seam in the tin, which is thrown one side while the wire runs on to another reel. About 20,000 pounds of tin are used in this manner with a loss of 10 per cent. per month, due to dross and remelting. The wire is then taken off the reels and coiled into required lengths. These coils are dipped into tanks containing black wax and are then allowed to dry.

Now the wire is finished? No, indeed; it is only ready for the testing room, shown in Fig. 4. This important department is in charge of Electrician Richard Varley, who has four assistants. Mr. Varley has invented several ingenious pieces of electrical apparatus, which greatly facilitate the work of testing. The coils of wire are thrown into tanks of water, where they remain three days and three nights. The testing laboratory is equipped with the best obtainable instruments, including five Thomson deflecting galvanometers.

A current of 150 volts is used for ordinary insulation tests, while a 2,000-volt current is used for testing electric light cables. The slightest faults are at once detected and the section containing the flaw cut out. The company has orders for every coil of wire it makes, but when any wire is put in stock in the store room, even if only for a day, it must undergo another immersion test of two days, to discover any faults due to mechanical injury received in handling it. The Okonite wire which took the gold medal at the late Paris Exposition went through the testing room just as ordinary wire, Mr. Jones refusing to tell Mr. Varley when he was going to select it. The Okonite Company do not believe in special tests—all the wire being of one quality.

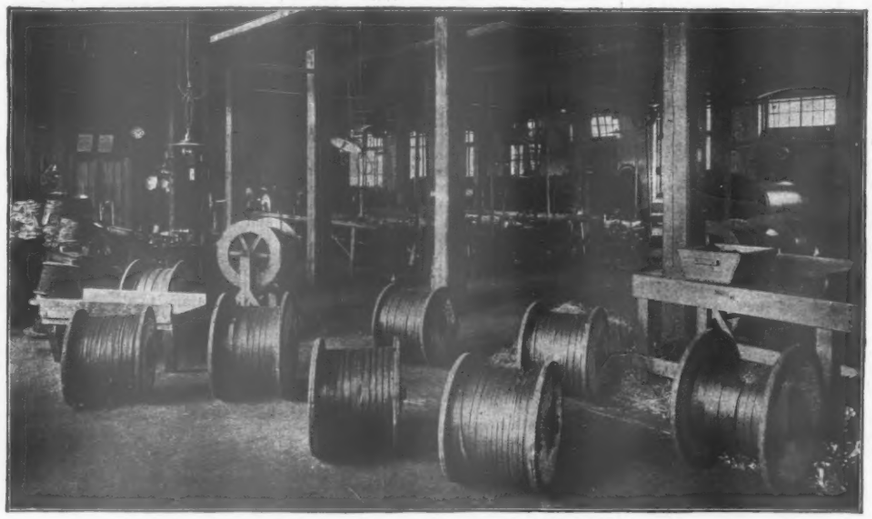


FIG. 1.—COVERING MACHINES, OKONITE FACTORY, PASSAIC, N. J.

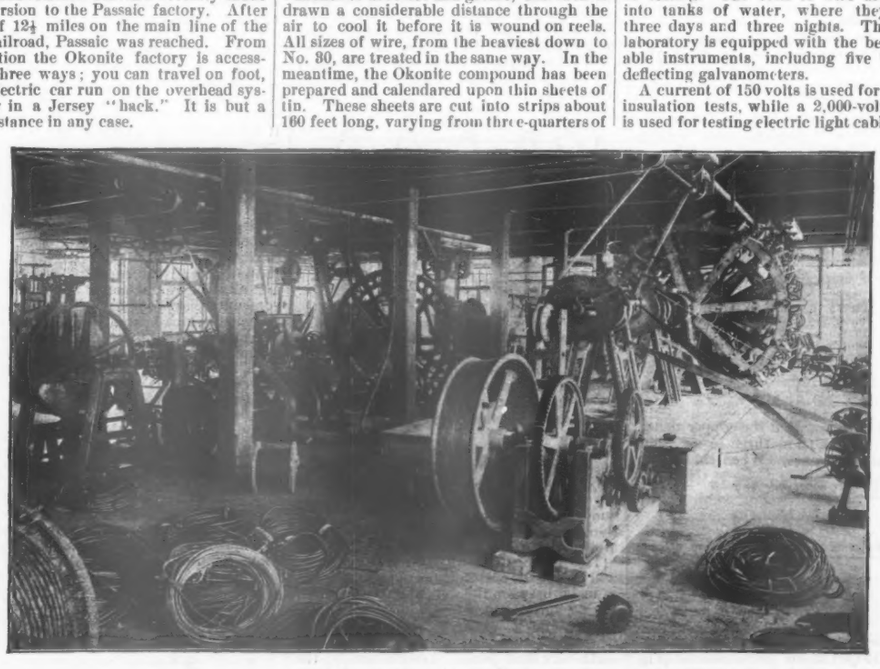


FIG. 2.—CABLING AND ARMORING MACHINES, OKONITE FACTORY, PASSAIC, N. J.

In testing with the galvanometers, Mr. Varley uses four candle-power incandescent lamps for light, instead of gas or oil. The lamps are run from storage batteries, which are charged every two weeks.

The wire for inside incandescent lighting is given the same severe tests, water and all, as the heavy cables. After the wire leaves the testing room it is placed in the shipping room, but it does not remain there long, as there is always a train of freight cars on the track outside the door, waiting to take away the wire as fast as it is made.

Some of the Okonite wire is covered with tape, and some is covered with braided silk. Fig. 3 shows over 175 braiding machines used in covering wire for inside incandescent lighting.

Nearly all the machinery used in the building is peculiar to the manufacture of

FIG. 4 .—TESTIGN LABORATORY, OKONITE FACTORY, PASSAIC, N. J.

Okonite wire and the larger part of it has been devised right in the factory.

Cables for all purposes are also made. Fig. 2 shows the cabling and armoring machines. The cabling machine has been brought to a high state of perfection by Superintendent Jones, and resembles very little the original machine used for this purpose. The cables are served with jute, and armored with galvanized iron wire. In laying up the cable, a layer of Okonite tape alternates with a layer of wires. The machines are arranged to take out the natural twist of each strand, due to the revolution of the spool on which it is wound.

Just outside the main entrance is a huge iron crane which is used to lower the big reels of cable into a tank of water in the ground where the immersion tests are made.

On the top floor of the main building is where the ingredients composing the Okonite compound are put together. Very few people know the slightest thing about this mixture. Several of our English contemporaries have published analyses of this compound which have been a source of much amusement to the Okonite people.

Letters by the Electric Route.

The longest telpherage line in the world is to be opened this month in South America. This overhead electric railway will be 186 miles long, and will connect Buenos Ayres with Montevideo. Its object is to allow of traveling letter boxes to be dispatched every two hours between the two cities. The line will cross the La Plata estuary in that part where it is 19 miles wide. The two wires there will be supported on either side of the river by two towers nearly 270 feet high.

Electricity and Etching.

It is announced in Berlin that an important discovery has just been made in etching, and especially in photogravure. As usual, the drawing is traced on a plate of zinc, either by an artist or by photography, with any suitable etching ground. This plate, backed with asphaltum, is laid in a bath of dilute acid. It is then put in circuit with a dynamo, the other pole being merely placed in the acid. When a current is allowed to pass, the acid attacks the metal with surprising rapidity. A few minutes suffice to bite the plate, and the depth of the etching can be easily controlled. It appears to us that the action is probably due to the depolarization of the surface of the metal, which in the ordinary method of etching becomes covered with a film of hydrogen, or, at all events, with a number of minute bubbles, which make the biting irregular unless the plate is incessantly rocked and brushed.

.... The Postal Telegraph Company is putting up two wires between Kansas City and Denver to accommodate its increasing business.

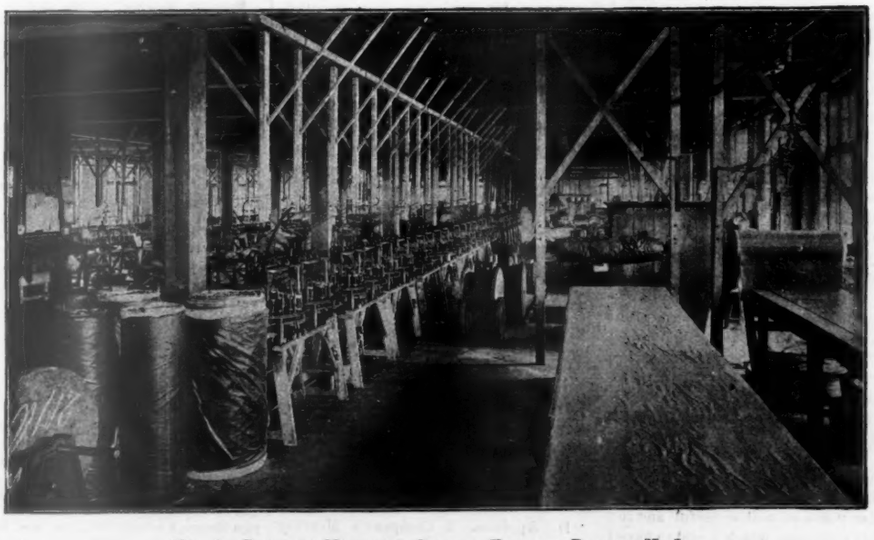


FIG. 3.—BRAIDING MACHINES, OKONITE FACTORY, PASSAIC, N. J.

Damages for a Shock.

In the Common Pleas Court at Louisville, Ky., on August 6th, Clark W. Tucker filed suit against the Brush Electric and the Louisville Electric Light Companies for personal injuries sustained by coming in contact with some electric wires on the night of September 15th last. In his petition he states that by coming in contact with the electric wires he was badly shocked and is still paralyzed in the right arm and shoulder. He prays for judgment in the sum of $25,000.

Tore Down the Depot.

"A train was being drilled in the yard of the Broad street station of the Newark and New York Railroad, yesterday afternoon, when an electric light wire beneath the low depot shed caught a high refrigerator car. Instead of the wire breaking when drawn taut, 2,000 square feet of the structure were torn down."—*New York Press.*

That was certainly hard on the roof, but it speaks volumes for the wire and the construction work of the electric light company.

A Newspaper Story.

[From "Gallegher, a Newspaper Story," in August *Scribner.*]

"Mr. Dwyer, sir," he began, faintly, with his eyes fixed on the managing editor, "he got arrested—and I couldn't get here no sooner, 'cause they kept a-stopping me—but" he pulled the note book from his breast and held it out with its covers damp and limp from the rain, "but we got Hades, and here's Mr. Dwyer's copy."

And then he asked, with a queer note in his voice, partly of dread and partly of hope, "Am I in time, sir?"

The managing editor took the book and tossed it to the foreman, who ripped out its leaves and dealt them out to his men as rapidly as a gambler deals out cards.

Then the managing editor stooped and picked Gallegher up in his arms, and sitting down, began to uniace his wet and muddy shoes.

Gallegher made a faint effort to resist this degradation of the managerial dignity, but his protest was a very feeble one, and his head fell back heavily on the managing editor's shoulder.

To Gallegher the incandescent lights began to whirl about in circles, and to burn in different colors; the faces of the reporters kneeling before him and chafing his hands and feet grew dim and unfamiliar, and the roar and rumble of the great presses in the basement sounded far away, like the murmur of the sea.

And then the place and the circumstances of it came back to him again sharply and with sudden vividness.

Gallegher looked up, with a faint smile, into the managing editor's face. "You won't turn me off for running away, will you?" he whispered.

The managing editor did not answer immediately. His head was bent, and he was thinking, for some reason or other, of a little boy of his own, at home in bed. Then he said, quietly, "Not this time, Gallegher."

Gallegher's head sank back comfortably on the older man's shoulder, and he smiled comprehensively at the faces of the young men crowded around him. "You hadn't ought to," he said, with a touch of his old impudence, "'cause—I beat the town."

TELEGRAPHIC

.... The Postal Telegraph Company is running three new wires from Pittsburgh to Chicago.

.... Little Rock, Ark., wants the Postal Telegraph Company to establish an office at that place.

.... Boston has a telegraph service which can handle 2,000,000 words of press dispatches per night.

.... Arrangements are being made by which the Waterbury, Conn., District Telegraph Company is to go into the hands of a new company.

.... The postal telegraph agent at Olympia, Wash., refused to submit telegrams pertaining to the book bribery case to the grand jury, which is investigating it.

.... William H. Abel, an old-time telegrapher, died at his home at Rockaway, on August 8th. After graduating from the College of the City of New York, he entered the employ of the old American Telegraph Company, and remained there until it was absorbed by the Western Union Telegraph Company. He was first auditor of the latter company for several years.

.... The New Jersey Postal Telegraph Company, planning to further its project of extending its lines through Newark and its neighboring towns—Plainfield, Somerville, Bound Brook, Woodbridge, Long Branch, and other places—will apply to the various municipal bodies at early meetings for permission to erect poles on the streets and string the necessary wires. Some of the City Councils are thought to be opposed to the line.

.... General Wire Chief Baldwin, of the Western Union Telegraph Company, is dangerously ill with pneumonia. Since the big fire he has been indefatigable, and he contracted a cold in the water-soaked building which developed rapidly into pneumonia. Bulletins of his condition are regularly posted on the board in the operating room. Mr. Baldwin knows where every one of the 2,000 or more wires that enter New York run to, and he is about the only man who does.

North American's Plans.

A press dispatch from Pittsburgh says the North American Telegraph Company has vast improvements under way.

In 60 days' time a complete line of copper wire will stretch from New York to California and other points.

These improvements will cost $2,500,000. They also contemplate new lines from New York to Cleveland and from New York and San Francisco to New Orleans and Texas points, besides numerous loops from various headquarters. New poles are being used in all this work, which comprehends several thousand miles.

In the entire work, 18,000 miles of wire will be used. The North American Telegraph Company, to facilitate business, has divided the country into three districts, the Eastern, Western and Southern. The Eastern district, in which Pittsburgh lies, extends from the Atlantic coast to Ohio. In this district 1,000 miles of poles are being erected. A new trunk line is being constructed from Cleveland to Pittsburgh and Pittsburgh to New York. The last named "trunk" will be equipped with eight copper wires. It follows the National Turnpike and thence to Philadelphia.

By loop, the numerous near-by towns will be taken in which have hitherto had only Western Union or B. & O. service. The line from Cleveland to Pittsburgh will serve Rochester and the Beaver Valley towns. The line from New York to Cleveland will serve cities and towns *en route*, and from Cleveland to Chicago will pass points on the Southern shores of the lakes. The work on the line from Cleveland to Altoona is prosecuted under the direction of Manager John Campbell, of the Pittsburgh office. Mr. Campbell says the work under his charge will be completed ahead of time. He is much pleased at the progress.

The Southern lines will stretch from Birmingham, Ala., to Natchez, Vicksburg, Jackson, Miss., New Orleans and way points. Another Southern line will extend from Wichita, Kan., through all principal points to Texas. A new line, connecting Denver with the East, has been completed, and from Denver lines will be run to San Francisco, taking in Salt Lake City, Ogden, etc. The Pittsburgh-New York trunks' eight wires will be worked by single, duplex and quadruplex instruments.

* * Zanesville, O., is to have an electric street railway.

* * The electric railway at St. John, N. B., is nearing completion.

* * The electric railway at Providence, R. I., is being rapidly completed.

* * The electric railway at Wilkes-Barre, Pa., carried 41,000 passengers during July.

* * The first car operated by electricity in New Orleans was given a trial on August 8th.

* * A project is on foot to connect Ypsilanti and Ann Arbor, Mich., by an electric railway. It is proposed to run trains every hour.

* * The Thomson Electric Welding Company is building a large plant at Newark, N. J., for the purpose of welding tubes for ice machines.

* * It is stated that efforts are being made to induce the Edison Electrical Manufacturing Company, of Schenectady, to locate an extension of its plant in Mechanicsville, N. Y.

* * Last week the storage battery car on the Rhomberg system was given a trial at Dubuque, Ia. The trial was successful, and now the people out there won't talk anything but storage batteries.

* * The Minneapolis, Minn., Street Railway Company has now completed nearly 35 miles of the new electric lines, and work on the remainder is being very rapidly pushed. It is expected to have half the lines completed by November 1st.

* * M. W. and M. F. Parrish, of Detroit, have recently been granted patents on an electrical battery. The elements are graphite and zinc, and the fluid, sodium chloride. A stock company has been formed for the manufacture of the battery and the patents transferred to it. The capital is $200,000 and the officers are: Robert McKinstry, president; James A. Randall, vice-president; A. A. Boutell, secretary, and M. L. Williams, treasurer.

* * Our newsy contemporary, the New York *Sun*, thus speaks of electric power, in which the work of the motor is summed up as follows: "In some cities, so far has the use of electric motors gone, that it is possible for a man to-day to drink at breakfast coffee ground and eat fruit evaporated by electric power. During the morning he will conduct his business with electrically-made pens and paper ruled by electricity, and make his records in electrically-bound books, his seventh-story office, in all probability, being reached by an electric motor elevator. At luncheon he will be able to discuss sausages, butter and bread, and at night eat ice cream and drink iced water due to the same electrical energy. He will ride all about the place in electric cars, wear shirts and collars mangled and ironed by electric motor, sport a suit of clothes sewn and a hat blocked by the same means; on holidays ride a merry-go-round propelled by electric motor, or have his toboggan hauled up the slide with equal facility; be called to church by an electrically-tapped bell, sing hymns to the accompaniment of an electrically-blown organ, be buried in a coffin of electric make, and, last of all, have his name carved on his tombstone by the same subtle, mysterious, all-pervasive and indefatigable agency. This may sound like a wild and exuberant flight of fancy, but it is simply a faithful statement of the manner in which electricity is being applied to every one of the necessities and luxuries of life in America."

* * The street railway company in Indianapolis owns a farm of 250 acres, six miles out of the city. This tract of land, covered with beautiful trees, the company has recently opened as Fair View Park. Now the citizen of Indianapolis on a hot night can get a 12-mile ride on an electric car operated on the Thomson-Houston overhead system, and as much time as he wants under the spreading trees, all for the amount of money he would spend in a cigar. The railway companies are philanthropists as well as capitalists.

* * The Newark, N. J., Passenger Railway, Company has decided to build the line to Orange and equip it with the overhead electric system, whether East Orange grants the franchise or not. If that township refuses to grant the right, the road will be operated in two sections. The company's Newark plant will run the cars from the terminus in Newark to the East Orange line, and there the passengers will be transferred to horse cars. At the Orange line the electric system will be again taken up, and after another transfer the passengers be carried to their destinations. It is thought after a few months' experience with the discomforts of the double transfer, the East Orange authorities will grant the desired consent.

An Electric Automaton.

Mr. George R. Moore, of Lowell, Mass., a retired mill owner, has constructed an electric man that walks about with every appearance of life and is made to be useful as well as ornamental by pushing a perambulator. The chair over which he presides is a light wickerwork affair, like those of a half grown trotting sulky. There is a footboard which is used for carrying the batteries which put the propelling power into the electric man's muscles of wood and steel.

The man stands directly behind the chair. If he were flesh and blood he would just come inside the limits as a light-weight sparrer, and as far as all appearances go, would be about 25 years old. He is connected with the chair at about the point at which the human diaphragm is popularly supposed to be located.

There is a pushing bar above this, on which his neatly gloved hands rest, but this is more for vanity than utility. He is dressed in the height of fashion, being attired in a new suit of gray mixed goods, white shirt with collar and cuffs to match and a soft felt hat. He has a number of changes of clothing and can be dressed for Fourth of July or Christmas weather, just like any man. He wears a No. 6 shoe, four wide, and sports a Louis Napoleonic moustache. Met upon any thoroughfare he would be marked for his general style and dignified bearing. Just at present his complexion is a little off color, but he is to have this treated with the most approved toilet preparations that the paint pot can produce.

The action of the feet and legs, which the inventor has reached with this machine, is a remarkable imitation of a human being. There is none of the jerky motion that is so commonly seen in mechanical figures. Each foot, as it leaves the ground, rises naturally on the toe with the same springy motion that is characteristic of the graceful walk among men and women. As in the taking of the foot from the ground, so in replacing it at the end of the step, the motion is free from jog or jar and is entirely natural.

The electric man is provided with a six horse-power battery, which is amply sufficient to enable him to push the fattest dowager up a hill.

It is Mr. Moore's intention to make his electric man polite as well as useful, and to that end his right arm, which is said to have more joints and bones than the corresponding member of the human body, will be so arranged that he can raise his hat gracefully as he receives a fare.

Publisher—What the dickens are you running that electric motor fan so hard for?

Circulation Editor—Don't bother me, I'm trying to get up a circulation.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire, Electrical Securities, 18 Wall street, N. Y., Saturday, August 16. New York, Boston and Washington Stock Exchanges.

NEW YORK.	
Western Union Telegraph Co.	88.
Edison General Electric Co.	105.
" " " Deferred	94.
Consolidated Electric Light	60.
Edison Electric Illuminating Co.	70.
United States Electric Light	35.
BOSTON.	
Thomson-Houston Electric Co.	51¼.
" " " Preferred	25¾.
" " " Series C	12.
" " " Series D	6.
" " International	
" " Welding Co.	
" " European Welding Co.	90.
Ft. Wayne Electric Co	12⅛.
TELEPHONE:	
American Bell	225.
Erie	51.
New England	50.
Mexican	
Tropical American	1¼.
MISCELLANEOUS:	
Edison Phonograph Doll	3¾.
WASHINGTON.	
Pennsylvania Telephone	26.
Chesapeake and Potomac	*78.
American Graphophone	16.
United States Electric Light (Washington)	150.
Eckington and Soldiers' Home Railway	68.

*Ex. Dividend.

A New Rosette Cut-out.

The Bryant Electric Company, of Bridgeport, Conn., have just begun manufacturing a rosette cut-out which possesses some points of novelty in construction. The cap is detached from the base simply by inserting a screw driver in the hole recessed for that purpose in the cap, and loosening the

screw one or two turns. The cap is now easily removable, and the fuses can be inserted while out of contact with the circuit. There are few parts in this device, none of them loose, and firm electrical contacts are made.

BOOK NOTICES.

"Guia Comercial de La Provincia de Tarapaca," for 1890, has been received. Mr. Arturo A. Correa is the editor and proprietor of this handy little journal. It contains much that is of interest—to a Spaniard.

"Introduction to Poor's Manual of the Railroads of the United States, for 1890," presents facts of the utmost value regarding our railroads. There is also a colored map showing the number of miles of track laid in this country each year since 1886.

"Proceedings of the Canadian Institute, Toronto," for April, 1890, contains a number of interesting scientific papers, but we do not note any bearing upon electricity or its applications.

Through the kindness of Mr. Wm. L. Puffer, Instructor in Physics at the Massachusetts Institute of Technology, Boston, we have received a number of papers on electrical subjects which have appeared in the *Technology Quarterly* from time to time. The *Quarterly* is among the most valued of our scientific exchanges.

"Bulletin of the Agricultural Experiment Station, Cornell University," for July, has been received.

"D. Appleton & Company's Monthly Bulletin," for July, gives interesting hints and news about the company's new publications.

"The Western Engineer," for July, has been received from the Pond Engineering Company, St. Louis.

"Whipple's National Electrical Directory," for 1890, is one of the most comprehensive publications of the year. It is larger and better than ever. All the electrical fraternity hail its arrival with delight.

ON THE WING.

OUR BOSTON CORRESPONDENT IN SOUTHERN NEW ENGLAND.

HARTFORD, CONN.

Business in this City, particularly among the electrical industries, is remarkably active for mid-summer. On nearly every thoroughfare, linemen and other workmen connected with the Hartford Light and Power Company, the Hartford Electric Light Company and Southern New England Telephone Company, may be seen daily erecting additional poles and structures and extending or improving their respective circuits.

The Hartford Light and Power Company has completed new additions to its station. The handsome and roomy brick "L" just finished contains three 750-light Westinghouse alternating machines and one 30-light Schuyler arc machine, which derive their power from Westinghouse, Jr., upright engines. At the present time there are three of these engines in position in the new building, two being of 125 horse-power and one of 60 horse-power. Another large engine of same make will soon be added to the new equipment. The company's old station comprises the following: One Edison power generator, which supplies current for the electric propulsion of the street cars on Wethersfield avenue line; two Mather incandescent dynamos for furnishing power to factories, running elevators and other purposes; four 700-light Westinghouse alternating machines for long distance incandescent lighting; two 30 light Waterhouse arc machines; five Westinghouse, Jr., engines (upright) of 75 horse-power each and one 1de engine of 80 horse-power. The large boiler house is connected with both stations and contains 20 Pitkin boilers of 85 horse-power each. This company also furnishes steam for heat and power, and has a large plant devoted especially for that purpose. The officers of the company are, president and treasurer, Mr. David Henney; secretary, Mr. W. W. Jacobs; superintendent and electrician, Mr. L. F. Furlong.

The Perkins Lamp Company has concluded to remove its Hartford office at once to its factory at Manchester, Conn. Business was never more prosperous with the company than at the present time. Additional men have been employed and new machinery purchased.

The Sigourney Tool Company is very busy filling orders from electrical manufacturing companies for its improved spindle drills. This company has recently put upon the market a three spindle drill which is sure to meet the requirements of electrical machine shops. These drills are sensitive, strong and interchangeable. The company will send to any address on application its new price list "B."

Manager Newton, of the Jewell Belting Company reports the demand steadily increasing for light double dynamo belts from local electric light companies, and those manufactured by the Jewell Company give thorough satisfaction.

As near as could be ascertained the following Hartford companies will probably be represented at the meeting of the National Electric Light Association: Jewell Belting Company, dynamo belting; Sigourney Tool Company, spindle drills; Hartford Light and Power Company, local electric lighting; Hartford Dynamic Company, electrical engineers; Billings & Spencer Company, copper drop forgings.

The Neighboring Town of Manchester, Ct., will have its two large electrical enterprises well represented at the Convention. I refer to the Perkins Lamp Company and the Mather Electric Company.

NEW BRITAIN, CONN.

It is Reported that the Russell-Erwin Manufacturing Company will soon enter the electrical field with several lines of special goods.

The Factory and Residence of Mr. Thos. H. Brady, manufacturer or the justly celebrated Brady Mast Arm, is in this lovely and enterprising town. Mr. Brady has just past through a long sickness, and is rapidly recuperating in health and strength. He expects to meet many of his old friends and customers at Cape May. Mr. Brady very kindly furnished me the following data: Meriden Gas and Electric Light Company will soon furnish the streets of Meriden, Conn., with 40 additional arc lights and other extensive improvements will be made in and about the station by Superintendent Hadley. It is probable that the Brady Mast Arm will be used, as those in use for some time past on Meriden thoroughfares have given thorough satisfaction.

ELECTRIC CLUBS.

New York Electric Club.

A Number of new names is awaiting the action of the membership committee.

At the Last Meeting of the board of directors, a great deal of business relating to the financial status and management of the Club was transacted. The following committees for 1890–1 were appointed and others will be appointed at the next meeting of the board. House Committee.—J. C. Chamberlain, J. J. Carty and the president and secretary. Finance Committee.—O. E. Madden, W. L. Candee, S. Insull, Chas. W. Price, W. T. Moore. Entertainment Committee.—Chas. W. Price, C. E. Stumpp, E. E. Bartlett and Geo. B. Prescott, Jr. Electrical Committee.—J. J. Carty, J. C. Chamberlain, T. P. Conant.

Several Active Members of the Club have proposed a subscription dinner, to be spread at the Club house, on Thursday evening, October 2d. The cost will approximate the reasonable figure of $5 per plate, and each member will be entitled to invite one friend. As the number sitting down to the dinner will be limited, application for places should be made to the secretary of the Club, addressed to the Club house, as soon as possible. Members and their guests will be seated in the order of their applications. The object of the dinner is purely a social one, and by this means it is hoped to get together a large number of members to renew old associations after the Summer vacation. The entertainment of the evening will be of a light—electric light—order, consisting of music, readings and remarks by members and their friends.

As Fall Approaches the attendance at the Club is rapidly increasing, and it is predicted that the coming Winter will be the most successful season the Club has ever enjoyed.

California Electrical Society.

President Keith reported at the meeting of the California Electrical Society, held August 5th, that he had been promised $100 of the $200 to be raised by subscription for the purchase of a library. Specimens of the wire to be used in the electric light system of the cruiser "San Francisco" were exhibited also at the meeting and viewed with interest. The evening was passed in the discussion of self-induction in parallel wires.

Telegraph Company Sold.

Messrs. Adrian H. Muller & Son sold, at auction, at the New York Real Estate Exchange, on August 12th, by order of William N. Armstrong, referee, all the corporate rights, privileges and franchises of the Bankers' and Merchants' Telegraph Company, of the States of New York, New Jersey, Pennsylvania and Maryland and the District of Columbia; also, their appurtenances, merchandise, real estate, fixtures, patents, rights, etc., for $390,000, to Colonel Robert G. Ingersoll. The sale was under a decree of foreclosure, brought by the Farmers' Loan and Trust Company, as trustee, to procure a clear title.

The First Atlantic Cable Signals.

Thirty-two years ago the first signals were sent through the Atlantic cable from shore to shore. It is hard to realize, as we lay before our readers to-day dispatches from every continent on the globe concerning to-day's events, that it is only 32 years since the genius and energy of Cyrus W. Field brought to successful completion the first ocean cable. To-day there is a network of them around the globe—except across the Pacific, and that omission will not long remain—and we take our news of the same day from London, Zanzibar or Hong Kong, as much as a matter of course as we do our news of New York and Chicago.—*Mail and Express.*

—— The Allentown Electric Light and Power Company, Allentown, Pa., which for some time has been using the Westinghouse alternate current system of incandescent lighting, has just placed an order with the Westinghouse Company for another machine, it being found necessary to increase the capacity of the plant to 2,000 lights.

Another for Brush.

At Toledo, O., on August 15th, Judges Brown and Ricks filed an opinion on the final hearing in the case of the Brush Electric Company *vs.* the Western Electric Company regarding the double carbon arc lamp patents. Decision was rendered against the Western Electric Company, sustaining the Brush patents. An injunction was granted and an accounting for infringement ordered.

THE NEW LAMP OF THE NATIONAL ELECTRIC MANUFACTURING COMPANY.

PERSONAL.

Mr. C. R. Field, of the Habirshaw Insulated Wire Company, is in the West on a business trip.

Mr. Geo. H. Roe, the eminent electric light man, of San Francisco, is in the East, and makes his New York headquarters the Electric Club.

H. T. Edwards, formerly of Oxley, Giddings & Enos, is now connected with the Edison General Electric Company. Mr. Edwards is a man of experience and judgment in the electrolier and fixture business in general, and will contribute largely to the acquiring of new business in this field.

Mr. Theo. P. Bailey, manager of the railway department of the Thomson-Houston Company, Chicago, was a visitor in New York last week with headquarters at the Electric Club. The Chicago office of the Thomson-Houston Company has rapidly developed in the past year or two, and Messrs. Sunny and Bailey are to be congratulated on this fact.

At least a dozen actors and actresses in London are practising their parts by aid of the phonograph. They have thus, as nearly as possible, the same opportunity as the audience, of judging of the correctness of emphasis and inflection used in any given passage.—*Chatter.*

Great Editor—I see it stated that the new electrical chair will not kill. Detail a reporter to try it. If he escapes, it will make the biggest kind of a sensation.

City Editor—But what shall I do if it does kill?

Great Editor—Get a new reporter.—*New York Weekly.*

The Bryant Electric Company.

The Bryant Electric Company, of Bridgeport, Conn., announces the absorption by it recently of the New England Electric Supply Company, also of Bridgeport. The Bryant Electric Company, with a capital of $100,000, full paid, organized under the laws of this State, proposes to push its line of specialties even further than in the past. The well known excellence of its work, coupled with the names in its directory (H. T. Clark, P. H. Alexander, J. M. Orford, W. C. Bryant and J. C. English) bespeak for its customers all that can be asked, and for the company a prosperous future. The Bryant double pole switch, the only double pole switch in the market that breaks the circuit at four points, is being sought for in larger quantities daily.

Another English Criticism of Electrocution.

The London *Lancet*, the leading English medical organ, discussing the Kemmler execution, says: "The operators in the Kemmler case used their mimic lightning with all the clumsiness of mortal inability. They burned the skull and a portion of the back, and exploded the sinuses of the brain. No doubt they were fortunate enough to render the man senseless at the first blow, just as they would have done if they had struck him on the head and back with a red-hot hammer, but there was found no mark of the electrical current in or through the viscera of the body. The man was killed by concussion of the brain and the explosion within the closed cavity of the skull, just as a man may be killed by apoplexy or sunstroke."

A Westinghouse Strike.

The strike of the Westinghouse Electric Company's, Pittsburgh, employés, determined upon at a previous meeting, went into effect on August 11th. Both plants are shut down, and about 1,200 men are idle. The men demand shorter hours. This is the first time the company has been involved in anything approaching a general strike.

A New Wall Bracket.

The same steady demand for higher insulation which has led to the production of good weather-proof wires, has also resulted in the bringing out of a finer quality of insulators and of better means of supporting them. These latest of these improved supporting devices is shown in the accompanying cut. It is called the "Springfield Bracket" and is manufactured by the Great Western Electric Supply Company. Being made of malleable iron with a ribbed arm and a hollow screw, it is very light, strong and tough. The split screw has a slight give to it and grips the insulator tightly. The wall plate is also novel in design, being so shaped as to give a large spread with very little metal. The makers have in preparation other forms of malleable iron brackets embodying the same good features as the above.

ELECTRIC LIGHT NEWS

—— Dubuque, Iowa, has contracted for 100 arc lights to take the place of gas.

—— The post office at Jersey City, N. J., has been fitted up with Edison incandescent lights.

—— The total capital of the Chaudiere, Ottawa, Electric Light and Power Company has been increased from $100,000 to $500,000.

—— The electric light company at Bethlehem, Pa., will shortly increase its capital stock from $50,000 to $100,000 and enlarge the plant.

—— Media, Pa., seems to thoroughly appreciate the electric light. The Media Electric Light, Heat and Power Company has a 1,500 Westinghouse alternate current plant and is now ordering an additional 500-light machine, with a view to keeping up with the demands of its customers.

—— The mortgage papers of the Seattle, Wash., Electric Light Company were examined last week, preparatory to filing them and issuing the company's new bonds to the amount of $300,000. The bonds will be floated by the Oregon Transcontinental Company, and extensive improvements will be made in the present plant.

—— The Westinghouse alternate current incandescent system is being employed for central station lighting in every State and Territory of the Union, with the exceptions of the State of Nevada and the Territory of Arizona. In the State of Texas, 20 lighting companies have seen fit to adopt the Westinghouse system. In Pennsylvania, the Westinghouse stations number very nearly 40.

—— The directors of the Brooklyn Municipal Electric Light Company met last week, at the offices of the company, 106 Broadway, for the purpose of electing seven trustees for the ensuing term. There was but one ticket in the field and it was elected unanimously, the election being most harmonious. The new trustees are: Matthew Dean, Edgar Holliday, James L. Jensen, Clement Lockitt, John Hills, Bernard Gallagher and Edward G. Graff.

—— In an interview, last week, George A. Redman, superintendent of the Brush Electric Light Company, at Rochester, N. Y., said that a colored man, who formerly worked for that company, had frequently taken 1,800 volts without injury, catching the wire in his naked hands. Mr. Redman said he had shocked a mud turtle with a current until it was stiff and apparently dead, but on putting it in a pail of water, it revived and walked away.

—— A press dispatch from Washington, D. C., states that William Ross, an employé of the United States Electric Light Company, while changing carbons in one of the city electric lights, received a shock of 2,000 volts. He was almost instantly rendered insensible, but soon recovered. His right hand, where the current entered, and his left arm, where it passed off, were badly burned. He said that for four or five seconds before he became insensible he suffered great pain.

—— The East River Electric Light Company, of New York city, has mortaged its rights and franchises to the Holland Trust Company for $600,000. In 1885, when it was organized, it mortgaged its effects to the same company for $300,000. Under the assignment just recorded, the original loan is taken up, and the company gets the $300,000 additional for its immediate use. The East River Company has not extended its wires through the subways over the extent of territory which its overhead wires occupied. With this $300,000, its officers say, it will make all necessary extensions and enlarge its plant at 425 East 24th street.

RULES AND REGULATIONS FOR THE INSTALLATION OF ELECTRIC LIGHTING AND MOTIVE APPARATUS.

The rules published below have been jointly adopted by the Boston Manufacturers' Mutual Fire Insurance Company, the Boston Fire Underwriters' Union and the Electric Mutual Insurance Company, and were prepared by C. J. H. Woodbury, F. E. Cabot, C. M. Goddard and S. E. Barton, and were issued August 1st, 1890.

DYNAMOS AND SWITCHBOARDS.

1. Dynamos must be located in dry places, not exposed to flyings or combustible material, and must be insulated upon dry wood, filled to prevent absorption of moisture. They must be kept thoroughly clean and dry. They must be provided with a reliable, automatic regulating device, or a competent person must be in attendance near the machine whenever it is in operation. In wiring for motive power, the same precaution should be taken as with a current of the same volume and potential for lighting.

Each machine should be provided with a water-proof cover, which should be used whenever the machine is not in operation.

2. Switchboards or other apparatus near the dynamos for controlling circuits and currents, should be so located that they will be accessible and open on all sides, and entirely disconnected from all wood-work or combustible material; also kept free from moisture. They should be incombustible and rendered non-absorbent of water.

MOTORS.

3. They must be located in dry places, not exposed to flyings or combustible material, and must be insulated upon dry wood, filled to prevent absorption of moisture. They must be kept thoroughly clean and dry. They must be self-regulating, or a competent person must be in attendance near the machine whenever it is in operation. All resistance boxes or devices should be made of non-combustible material, or so located that they cannot communicate fire to any surrounding combustible material. In wiring for motive power, the same precautions should be taken as with a current of the same volume and potential for lighting. The motor (and resistance box) should be protected by a cut-out, and controlled by a switch.

4. Motor cars driven by electricity from a single wire with earth or floor return circuit will not be approved in any building insured by this company. The use of such single trolley tracks may be permitted, after special inspection, in mill yards where there is no liability of other conductors coming in contact with the trolley wire, and where the conditions of the position of the generator is such that the ground circuit will not impose any fire hazard on the property.

5. Wires for electric lighting or stationary motors will not be permitted in the same circuit with trolley wires with ground return—the stock insurance companies will permit such installations, subject to special inspection and agreement, on payment of a suitable charge for the permit covering this increased hazard—although the same dynamo can be used, if desired, for both purposes, provided that the connection from the dynamo to each of the two circuits shall be by a double-throw switch, so that only one of the circuits shall be in service at the same time. In such cases the wires for lighting or stationary motors shall be in the usual manner, entirely on a metallic circuit without ground.

TESTING.

6. All circuits should be tested at least twice a day with a suitable magneto, or other approved device, in order to discover any escapes to ground that may exist. One test should be made in the morning, and another in ample time before starting to remove any defect, should it be found to exist. The rules for testing should be observed in any separate or isolated plant the same as in central stations.

Arc System.

OUTSIDE WIRES.

7. All outside overhead wires must be covered with some material of high insulating power, not easily abraded; they must be firmly secured to properly insulated and substantially built supports. All tie wires must have an insulation equal to that of the conducting wires.

8. All joints must be so made that a perfectly secure and unvarying connection, fully equal to the cross-section of the conducting wire, will be secured—and they should be soldered. All joints must be securely wrapped with an approved tape.

The following formula for soldering fluid is recommended: Saturated solution of zinc, 5 parts; alcohol, 4 parts; glycerine, 1 part.

9. Care must be taken that conducting wires are not placed in such position that it would be easy for water, or any liquid, to form cross-connection between them, and they should not approach each other nearer than one foot. The wires must never be allowed in contact with any substance other than air and their proper insulating supports; except that service wires with special insulation may be permitted to touch foreign substances.

10. Conducting wires carried over or attached to buildings, *must* be at least seven feet above the highest point of flat roofs, and one foot above the ridge of pitched roofs. Lines constructed subsequent to the adoption of these regulations should not be run over and attached to buildings other than those in which the light or power is being or is to be used, but should be on separate poles or structures, where they can be easily reached for inspection.

11. When they are in proximity to other conducting wires, or any substance likely to divert any portion of the current, *dead, insulated* guard-irons must be placed so as to prevent any possibility of contact in case of accident to the wires or their supports. The same precautions must be taken where sharp angles occur in the line wires, and also where any wires (telegraph, telephone, or others) could possibly, owing to their position, come in contact with the electric light wires.

12. Overhead wires from the main circuit or pole in the street to the terminal insulators attached to buildings, and at the point where they enter a building, must not be less than 12 inches apart. They must be rigidly and neatly run, and supported by glass or porcelain insulators or rubber hooks.

13. Service blocks must be protected by at least two coats of water-proof paint over their entire surface; and, when used to support rubber hooks, must have at least one inch of wood between the inner end of the hook and the back of the block.

14. For entering buildings, wires with an extra heavy water-proof insulation must be used from the terminal insulators through the walls from the outside to the inside of the building. They must loop down, so that water may drip off, without entering the building, and the holes through which they enter should, where possible, slant upward.

15. Wires must enter and leave the building through an approved cut-out switch, which must be "double contact," and should effectually close the main circuit, and cut off the interior, when turned "off." It must be so constructed that there shall be no arc between the points when thrown "on" or "off." It should be automatic in its action in either direction, not stopping between points when once started. It should indicate upon inspection whether current be "on" or "off." It must be mounted on a non-conducting base, kept free from moisture, and easy of access to firemen and police.

INSIDE WIRES.

16. Wires must not be concealed, and they must be rigidly kept apart at least one foot, unless an *approved, moisture-proof, non-conducting, non-inflammable tubing* is used. This tubing must be sufficiently strong to protect the wires from mechanical injury. It may be fastened to the wall by staples, provided the tubing is not broken or injured thereby. Wires in this class of tubing may be run as near as three inches to each other.

17. Conductors in buildings must be thoroughly well insulated with non-absorbent water-proof material, as incombustible as possible, which will adhere to the wire and not fray by friction, and will stand a temperature of 150 degrees without softening.

In places liable to dampness, wires must be thoroughly and carefully run on glass insulators, rubber hooks, or porcelain knobs of suitable size and shape, and the wires must be separated at least 18 inches. They must also be provided with an approved water-proof insulation, or encased in an approved tubing.

When wires pass through walls, floors, partitions, timbers, etc., indoors, glass tubing or so-called "floor insulators," or other moisture-proof, non-inflammable, insulating tubing must be used.

18. All lightning arresters must be grounded outside of building, and preferably connected to a water pipe.

ARC LAMPS.

19. The frames and other exposed parts of arc lamps must be carefully insulated from the circuit.

Each lamp must be provided with a proper hand switch, and also with an automatic switch that will shunt the current around the carbons should they fail to feed properly.

Stops of some kind must be provided to prevent the carbons from falling out in case their clamps fail to hold them; and these clamps must always be in place.

20. For inside use, the light must be surrounded by a globe resting in a tight stand, so that no particles of melted copper or heated carbon can escape. When any inflammable material is near or under the lamp, the globe must be protected by a wire netting. Unless a very high globe, which closes in, as far as possible, at the top, is used, it must be provided with some protector or spark arrester, reaching to a safe distance above the light. Broken or cracked globes must be replaced by perfect ones immediately. (By inflammable material is meant dry goods, clothing, millinery and the like, in stores; flyings or goods in fabric factories; shavings and sawdust in woodworking shops, or any other substance that can be readily ignited by droppings or flyings from the lamp.)

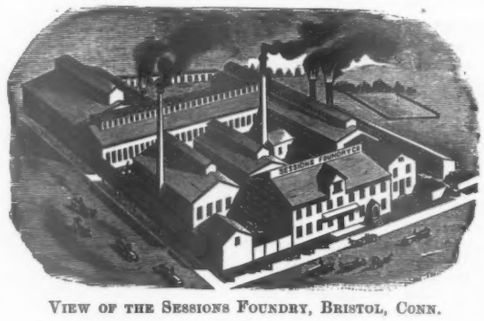
Incandescent System.

INCANDESCENT LAMPS ON HIGH TENSION CIRCUITS.

21. The rules for running wires for arc lamps apply also to incandescent lamps on circuits having a potential of over 350 volts. Incandescent lamps in single series on high tension circuits must be provided with a suitable hand switch, and also with an automatic device capable of shunting the circuit across the terminals of the lamp should the carbon filament break. When incandescent lamps are in multiple series, the hand switches must not control less than a single group of lamps, each of which may be provided with an automatic shunt, as above. Electro-magnetic devices will not be accepted as suitable for this purpose. Any method of distributing current to incandescent lamps on high tension circuits, other than as above provided for, must receive approval before being but to use.

OUTSIDE WIRES.

22. The rules (7 to 15) for outside arc wires also apply to outside incandescent wires, except that a cut-out switch in the circuit entering the building will not be required, but the wires from main circuit to main cut-out, inside of building, must be separated by a distance of not less than six inches for currents having an electro-motive force of 350 volts or less, and this distance must be increased for currents of higher potential. They must also be rigidly and neatly run, and must be supported by glass or porcelain insulators, or by rubber hooks.



VIEW OF THE SESSIONS FOUNDRY, BRISTOL, CONN.

UNDERGROUND SERVICES.

23. Where underground service conductors enter a building, special care is necessary that they shall not come in contact with each other, or be placed where there is any risk of disturbance by moisture or mechanical injury.

There shall not be any free opening from underground wire conduits to buildings.

The service must not end in any place where it would be unsafe or undesirable to place a cut-out, but should be continued by means of specially insulated conductors (and a space of 10 inches should be maintained between them) to a suitable location.

INSIDE WIRING.

24. For inside work, no wire smaller than No. 16 "B. & S." or No. 18 "B. W. G." will be approved. Before using any new form of insulation, the approval of its use under the proposed circumstances must be secured. The use of lead covered wire, or wire the covering of which contains paraffine, is prohibited.

25. Mouldings with open grooves laid against the walls or ceilings will not be approved. A wood moulding with dividing strips between the grooves, at least half an inch in thickness, and having a backing of at least one-fourth inch thickness to intervene between the wire and the wall or ceiling of the building, the backing to be protected by at least two coats of water-proof paint, and the moulding of such shape as to protect the wire from moisture, will be approved. Mouldings must not be used in wet places.

26. Wires laid in plaster, cement or other similar finish, or run over surfaces furred off for plastering, will not be approved, no matter what insulating covering is used. An approved moisture-proof, non-inflammable, insulating tubing or conduit may be used in such places. This tubing must be of sufficient size and so placed that the wires may be withdrawn and replaced at will. All joints and bends in this tubing must be made with suitable devices adapted especially for the purpose. Where this is done in a such a way that the joints are moisture-proof, a double-braided cotton insulation, rendered non-inflammable, may be used.

A separate tube must be laid for each wire, except in the case of "taps" for not more than 15 amperes, in which case conductors having insulation of cotton or other material which will readily carbonize, will be required. If a moisture-proof covering is desired, it must be placed outside the two conductors, and not between them. In other concealed places, such as unfinished lofts, between floor and ceiling, in partitions, etc., all wires must be covered with approved moisture-proof insulation, and fastened at distances not exceeding 10 feet, so as to preserve at least two and one-half inches between the wires or any other electrical conductor. In lieu of such construction, an approved moisture-proof, non inflammable, insulating tubing or conduit with approved moisture-proof joints may be used, and the same rule as to insulation will be applied as in the case where the tubing is buried in plaster or similar material. Tubing passing through walls or ceilings must extend at least one inch beyond the finished surface, until the mortar or other similar material is entirely dry, when the projection may be reduced to one-half inch.

Tubes of such approved make may be laid side by side when imbedded in plaster or otherwise. At all outlets to and from cut-outs, switches, etc., wires must be separated from gas pipes or parts of the building by porcelain, glass, or other non-inflammable insulating tubing, and should be left in such a way as not to be disturbed by plasterers. Wires of whatever insulation must not in any case be taped or otherwise fastened to gas piping. If no gas pipes are installed at the outlets, an approved substantial support must be provided for the fixtures.

Wires of the same polarity, but belonging to the different circuits, or leading to and from a double pole switch, must not run in one groove, through the same tube, nor in the same slot in a cleat.

27. In dye houses, paper and pulp mills, and other buildings specially liable to moisture, all wires (except those used for pendants) must be separated at least six inches. The wire must be thoroughly and carefully put up, and must be supported by glass or porcelain insulators, or by rubber hooks. An approved, moisture-proof, non-inflammable, insulating tubing will be accepted in lieu of such construction.

28. In crossing any metal pipes, or any other conductor, wires must be separated from the same by a block of wood or other non-conductor of at least one-half inch, and so arranged that they cannot come in contact with each other by accident. Wires should go *over* water pipes where possible. When wires pass through walls, floors, partitions, timbers, etc., indoors, glass tubing, or so-called "floor insulators," or other moisture-proof, non-inflammable, insulating tubing must be used. Wires must never be left exposed to mechanical injury, or to disturbance of any kind. Wires of the same polarity, but belonging to different circuits, or leading to and from a double pole switch, must not run in one groove, through the same tube, nor in the same slot in a cleat. Cleats should be made of well-seasoned hard wood (filled to prevent the absorption of moisture), porcelain, or other approved material, and so made as to separate the wire at least one-fourth inch from the building. When secured by cleats not over four feet apart and tightly stretched, wires having a difference of potential of 120 volts or less, and carrying not over 10 amperes, should be separated at least one and one-half inches; when they are confined in moulding, a half-inch space is sufficient. Mains carrying currents of larger volume should be separated a greater distance.

The use of metal staples for securing wire will not be approved.

29. Where exposed to corrosive fumes, wires should be provided with an insulation that will not be injured thereby; and should be put up in the manner described in Rule 27.

30. All splices in wires must be soldered in accordance with Rule 8. A soldering bolt should be used for this purpose, if possible. Care must be taken not to render the wire brittle by over-heating. The insulation

of any joint must be equal to that of other parts of the same wire.

SAFETY CUT-OUTS AND SWITCHES.

31. Every portion of each installation must be equipped with double pole, safety cut-outs, that will interrupt the passage of a current in excess of the amount which any portion of the apparatus is adequate to transmit. A cut-out must be placed where the underground or overhead service joins the inside wires, and at every point where a change is made in the size of the wire (unless the cut-out in the larger wire is intended to protect the smaller). The plug or other device for enclosing or supporting the fusible strip or wire should be incombustible and moisture-proof, and so constructed that an arc cannot be maintained across its terminals by the fusing of the metal. No lead or composition strips carrying more than 10 amperes before melting shall be used, unless provided with contact surfaces of some harder metal having perfect electrical connection with the fusible part of the strip. On any combination fixture, no group of lamps requiring a current of seven amperes or over shall be ultimately dependent on one cut-out. But there shall be a cut-out to each pendant and fixture.

32. Switchboards and cut-outs should be made of incombustible material and arranged so that there will not be any leakage of electricity across them. They should be put in places not liable to contact with foreign substances, nor exposed to moisture.

33. All switches, except those in lamp sockets, should be double pole.

They must have a firm and secure contact that will make and break readily, and that will not stick between "full on" and "off," nor get out of repair easily in other ways. The points of contact must not be allowed to scrape or rub the entire surface of an insulating material between the contact strips; an air space must intervene. The carrying capacity of the different parts must be sufficient to prevent heating.

FIXTURE WORK.

34. In all cases where wires are concealed within or attached to fixtures, the latter must be insulated from the gas pipe by some approved device.

When holes are drilled in fixtures, all burs or fins must be removed from the edge of the holes before the conductors are drawn through.

When wired outside, the conductors used must be so secured as not to be cut or abraded by the pressure of the fastenings or motion of the fixture.

All wire used for fixture work must have an insulation that is durable and not easily abraded; and must not, in any case, be smaller than No. 19 "B. & S." or No. 20 "B. W. G."

Each fixture must be tested for possible "contact" between wire and fixture, and for "short circuit," before current is turned on.

The tendency to condensation within the pipes or fixtures should be guarded against by sealing the upper end.

No combination fixture with less than one-fourth inch clear space between the inside pipe and the outside casing will be approved.

PENDANTS AND SOCKETS.

35. Cord pendants must be composed of stranded wire, and protected by rubber bushings, or something equally good, where they enter the socket.

When exposed to weather, or used in wet rooms, care must be taken to keep moisture from the inside of sockets.

The weight of every socket and lamp suspended by a cord must be borne by a ceiling block, rosette or cleat, and by a knot under the bushing in the socket, in order to take all strain from the joints and binding screws.

Flexible cord must not be used, except for pendants, wiring of fixtures and portable lamps.

SECONDARY GENERATORS OR CONVERTERS.

36. Converters must not be placed inside of any building, except central stations, and should be enclosed in a metallic or non-combustible case. They may be placed on the outer walls when in plain sight and easy of access, but must be thoroughly insulated from them. If placed on wooden walls, or the wood-work of stone or brick buildings, the insulation must be fire-proof. When an underground service is used, the converter may be put in any convenient place that is dry and does not open into the interior of the building; this location must have the approval of the inspector before the current is turned on.

37. If for any reason it becomes necessary that the primary wires leading to and from the converter should enter a building, they must be kept apart a distance of not less than 12 inches, and the same distance from all other conducting bodies.

38. Safety fuses must be placed at the junction of all feeders and mains, and at the junction of mains and branches when necessary; also in both the primary and secondary wires of the converter, in such manner as not to be affected by the heating of the coils. Secondary wires, after leaving the converter, will be subject to rules already given for inside wiring for incandescent lighting.

The secondary circuit may be provided with a film cut-out, which connects to the earth outside of the building; but permanently grounding the secondary circuit is unsafe and will not be sanctioned.

FOREIGN WIRES.*

39. No foreign wires of any kind shall be attached to buildings insured by this company, for the purpose of carrying electric currents across the yard to any point.

40. All electric wires which may be required by the insured shall enter the premises at one point, preferably near the headquarters of the night watchman, where they can be kept under supervision; each of said wires shall be guarded by a protector against strong currents, operating by opening the circuit, and by a lightning arrester.

41. Such protectors against strong currents shall be located in a dry, accessible place inside the building, and as near the point of entrance of wires as possible, and shall be without ground connection; such protectors shall be mounted on non-combustible and insulated supports, which shall be provided with a receptacle for the burning or melted parts of such apparatus.

42. The lightning arresters on all wires must be placed between the protector against strong currents and the electrical portion of the apparatus within the building to which such wires are connected. No ground wires for such lightning arrester shall be attached to gas pipes within the premises of the insured.

43. All electric wires which may enter the premises of the insured must be insulated between the line wire on the insulator attached to the buildings outside and the protecting device within with the best quality of water-proof insulation. Moreover, such wires must enter at a distance of not less than three inches from any other wire or any conducting material.

44. If any wires carrying high tension or strong currents are to be carried over or under other wires on the property of the insured, they shall be attached to poles so near to each other, with one wire so far above the other, that if a break should occur, the pendant wire between these poles may not be long enough to come in contact with the wire below, or, if not carried on poles, these wires shall be so placed or protected with guard wires as to render a contact between different wires impossible.

45. If the high and low tension systems are in use in the same yard, even when developed within the works, the wires must be kept separate, and so wide apart that no contact or cross arc can be made.

NOTICE.

46. The underwriters reserve the right at any time to add to, change, or modify these rules, and to enforce such modifications, changes, etc., as shall be deemed necessary for safety; all reasonable efforts will be made to notify promptly all electric light companies of any change.

*The position of the stock insurance companies is merely advisory upon this clause.

Sessions Foundry Company.

The illustration on opposite page gives a bird's-eye view of the Sessions Foundry Company, at Bristol, Conn.

This well-known corporation was established in 1878, and it has enjoyed a very large and steadily increasing trade with the electrical manufacturing companies throughout the country.

The company makes small castings for special electrical work, in fact, for several years the company has satisfactorily supplied a very large demand with castings for dynamo and motor magnets. Only the finest grade of iron is used by this company and it has a special process of melting, by which the castings when produced are sound, dense and, at the same time, very soft. Four large melting cupolas are run daily, which melt up an aggregate weight of iron of 40 tons.

The South Wants the Electric Light.

When the spirit of progress strikes a town, it is not long content without an electric light plant. Electric illumination is deemed a necessity wherever commercial activity is found. The South, as everybody knows, is developing rapidly at the present time, and, consequently, in that region there is large demand for electric light apparatus. The Westinghouse Electric Manufacturing Company has recently closed contracts for plants in three Georgia towns, Valdosta, Washington and Waycross. It is evident that the Empire State of the South is determined not to be distanced by its sisters.

What are "Bell Steel" Gongs?

The accompanying cut represents a wrought "Bell Steel" gong that is now being successfully placed upon the market by the Wilmot & Hobbs Manufacturing Company, who have their rolling mills and manufactories at Bridgeport, Conn.

These bells are made from a special grade of metal used only by themselves, and by a peculiar and secret process they are enabled to produce a bell highly finished in brass or nickel plate, not liable to rust, and one which demands the attention of every manufacturer who mounts bells for electrical

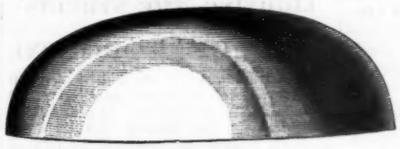


FIG. 1.—STEEL GONG FOR BELL.—WILMOT & HOBBS, BRIDGEPORT.

or other purposes, as well as the jobber in bell hangers' supplies.

The cut, Fig. 2, represents a cold drawn steel shell which is but one of the innumerable shapes and sizes that they draw. They have had to add new and special machinery, and among their very recent purchases are two peculiarly constructed presses weighing upwards of 25,000 lbs. each to supply the demand for large work, and they are now in spendid shape to undertake such work as well as the smaller classes of press, drop, and draw-bench work, in cold rolled steel, brass and other metals to order for manufacturers who have not facilities for the

FIG. 2.

manufacture of all the goods they require, and can furnish the goods japanned tinned, brass or nickel plated. The standing of this company is well known and its work of the very best.

Subway Company Not Enjoined.

Judge Beach, of the Supreme Court, has denied the application of the North American Underground Telegraph and Electric Company for an injunction restraining the Consolidated Telegraph and Electrical Subway Company and the New York Underground Telegraph Company from using any subway system other than the Johnstone system.

The judge holds that there is no covenant in the agreement that the defendants shall exclusively use the plaintiff's system, but, on the contrary, the wording of the instrument seems rather to give the defendants a right to limit the extent of the use according to their judgment upon the point of desirability and practicability. The right to an enforcement of such a covenant, even if in the contract, would be extremely doubtful, in view of the powers of the Board of Electrical Control in regard to subway construction. The injunction would probably seriously retard and interfere with a public work prosecuted by the Board of Electrical Control under authority of the State. In actions between individuals, the court hesitates, Judge Beach says, to grant writs of injunction *pendente lite*, and it should be even more exacting in those cases where public interests are directly involved.

Never good to eat—Electric currents.—*New York Mail and Express.*

The People and the Electrical Chair at the Eden Musee.

One night, last week, a representative of the ELECTRICAL REVIEW dropped into the Eden Musee to look at the wax figures portraying the Kemmler execution. This scene, which is very properly laid in the "Chamber of Horrors," is probably familiar to most New Yorkers, as it has been on exhibition for six months or more. The *ensemble* is good, but the details of construction are such that the absence of an expert's attention is apparent to an electrician. The dynamo has a tendency to look like a hand organ, but, on the whole, the picture is sufficiently correct to give the general public an idea of the electrical execution business.

It wasn't so much to look at the wax corpses that the REVIEW young man made this visit, as it was to hear what people said about the execution after it was over. It occurred to him that this was the place where he might hear the freely expressed opinions of the people, the *hoi polloi*, the plebians; all of which expressions, translated into every day New York, mean "the majority."

As the reporter approached the Kemmler group, a considerable gathering of people was crowded about the railing. It was a silent gathering; every one seemed impressed with the awfulness of the situation. Presently, down in front, near the railing, a little Frenchman, with tightly waxed moustaches, a high hat, and a vivid red cravat, turned his snapping eyes from the death chair to the crowd, and, raising his hands above his head, exclaimed in an excited manner: "*Mon Dieu!* Eet ees horreeble! And zees ees Amereeka, ze land of Libairty!" and with a shiver he broke through the crowd, and got out of the "Chamber of Horrors" as quickly as he could.

The people exchanged glances of approval after this outburst, but no one said anything till a great big fellow, who looked like a porter, drawled out: "Well, I'd ruther be hung any time than have all them straps and things on me."

The crowd kept moving, new faces coming up each minute. The next man to break the silence looked like a doctor. All he had to say was, "Well, I wouldn't have been in that room for anything." Then he moved off. A young fellow with a girl hanging on his arm elbowed his way up to the railing, and, in an excited whisper, said to his companion: "Look, Liz, there's the electricity chair; that's it." With eyes like saucers, they gazed and gazed until they were fairly crowded away by the people waiting for a look at the revolting sight.

A man wearing the uniform of a United States soldier passed in front of the railing, stopped a minute, looked intently at the scene, and then clicking his jaws together once, said, in a low voice, "God! that's hard on a man!"

"Well, I don't fancy that method of execution," was the remark of a gentleman who looked like a lawyer. He didn't stop long.

"Here he is! Here he is! Here's Kemmler! This is what we've been huntin' all over for. Come on, crowd in, girls!" This excited speech drew the attention of the crowd for a brief interval to a girl in a white dress, who seemed to be piloting a flock of young people like herself. They were not in a condition to think about executions much, so they flitted off to see the bent mirror, which makes a thin man look like a barrel.

Over in one corner, an old farmer, who looked like Den. Thompson in the "Old Homestead," had been standing open-mouthed and open-eyed for fully 15 minutes. He seemed chained to the spot by the horror of the scene. Pretty soon his wife, her face nearly hidden in an old-fashioned poke bonnet, came up to him and tugging at his coat sleeve, said, "Come on, Eph! come away; ye ben a-standin' there fer an hour, as if this nasty thing was a fire or sumthin'. Come on, let's go home; I'm sick." And Eph reluctantly went away from the fascinating sight.

Thus the crowd swept back and forth, some returning two or three times, as if unable to satisfy their morbid curiosity.

The impression of the REVIEW young man was that execution by electricity was not favored by the masses, and that a good place for Commodore Elbridge T. Gerry to stay away from was the "Chamber of Horrors" in the Eden Musee.

KINDRED INTERESTS

The Thomson-Houston Electric Company, Boston, have made another large shipment of car trucks to the Alano Railway Company, San Antonio, Texas.

The National Car Heating Company, Topeka, Kan., are issuing a catalogue describing Searle's method of steam heating cars. It seems to be particularly well adapted for the work intended.

The New York Edison Illuminating Company is equipping its Broadway conduits with an improved form of manhole. Considerable underground work is also being done along the west side.

"Indianapolis," is the title of a little pamphlet published by the Commercial Club, of Indianapolis, Ind. It is sent out to boom the city. A good map of the surrounding country forms the frontispiece.

The National Electrical Manufacturing Company, 16 Vesey street, New York, report a large business in all their specialties. Their factories are running night and day to keep up with orders.

The Butler Hard Rubber Company, 33 Mercer street, New York, report a good business in rubber electrical fittings. This company frequently turns out over 50,000 pieces of rubber goods per day.

The Sioux City Electrical Supply Company, who will furnish the electrical equipment for the Sioux City Corn Palace, to be built this Fall, have signified their willingness to take charge of any electrical exhibits for the palace, if sent in their care.

Pattison Brothers, electrical engineers and contractors, have opened offices at 135 and 137 Broadway, New York. Both of these gentlemen have had a wide experience in the electrical field, having been connected with various Edison interests for a number of years.

The Interior Conduit and Insulation Company, 16 Broad street, New York, are just publishing another pamphlet of testimonials regarding their system of wiring. The book is well gotten up, and contains fac-similes of letters from J. Pierpont Morgan, E. H. Johnson, Thomas A. Edison and Elihu Thomson.

The Faraday Carbon Company, of Pittsburgh, owing to the rapid growth of business and want of space, are going to move and enlarge their plant. They are now negotiating for the purchase of several acres of ground near Pittsburgh. It is their intention to erect one of the largest and best equipped carbon factories in the country.

The G. A. R. Parade gave the Pettingell-Andrews Co., Boston, an opportunity to extend another courtesy to their friends. A neatly gotten up invitation was received at this office stating that the company had reserved the house, 137 Boylston street, for the use of their friends during the parade. It was a choice place from which to see the seemingly endless column.

Queen & Company, of Philadelphia, report a steady and increasing demand for their specialties in test instruments. Their improved portable testing sets are meeting well deserved favor, as new features of great value to electricians have been introduced. These sets are being made in large quantities to fill orders already received. The new "Magnetic Vane" ammeters and voltmeters, as brought out by the same firm, are much sought after and are now in use by the Edison, Brush and Mather Companies. Meters of special size and range will be made if desired. A large collection of instruments has been placed on exhibition at Cape May during the Convention by Queen & Company, and all who are interested in the subject will be well repaid by a visit to their parlor, where everyone will be welcomed.

The Edison Manufacturing Co., Schenectady, N. Y., have issued a very handsome colored sheet advertising the Edison-Lalande battery. Mr. James F. Kelly, 19 Dey street, the general sales agent of the company, did some pretty rapid hustling recently in getting some of these into the Western Union building after the fire. About 280 Edison-Lalande batteries were used to replace over 1,600 blue-stone batteries.

TENDERS
FOR
LIGHTING THE STREETS
OF THE
CITY OF TORONTO.

Tenders addressed to the undersigned will be received by registered post up to 12 o'clock noon of TUESDAY, SEPTEMBER 2D, 1890, for the lighting of the streets, avenues, squares and lanes of the city of Toronto with electric light, gas light, or both, for a period of two, three and five years from the 1st of January, 1891.

Specifications and forms of tender can be obtained upon application at the office of the secretary of the fire department, corner of Bay and Temperance streets, Toronto.

A cash deposit or marked check, made payable to the order of the city treasurer, for the sum of three thousand dollars ($3,000), must accompany each and every tender, together with the *bona fide* signatures of two responsible persons, who will become sureties for the due fulfillment of the contract. The deposit accompanying the tender will be forfeited to the city, in the event of the person or persons, whose tender is accepted, failing to execute the necessary contract, or give satisfactory sureties for the due fulfillment of the same. Deposits of unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted. WILLIAM BELL,
Chairman Committee Fire and Light.
City clerk's office, Toronto, August 8, 1890.

TRAVELING MEN SELLING TO HARDWARE Plumbers, Steam and Gas Fitters, can secure a good side line by addressing
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ELECTRIC LIGHT PLANT.
Capacity, 600 Incandescent Lamps.

Exclusive franchise and contract with city. Dynamos and engine in first-class order. Full particulars had by writing to
ZEPH. CHAS. FELT,
Storm Lake, Iowa.

FOR SALE.—50,000 feet, second quality, 2½ and 3 inch creosoted tubing for underground wire work, at 3½ and 4 cents per foot.
The Wyckoff Pipe Company,
WILLIAMSPORT, PA.

WANTED.—Man to take charge of Detail Department of Electrical Factory. Must be a good mechanic and have had experience in managing men.

Applications should state experience and salary expected.

Address, "G. M.,"
Care of ELECTRICAL REVIEW, New York.

WE offer a large quantity of Stellar Incandescent Lamps, 50-volt, 16 candle-power, for Thomson-Houston sockets. Also 40 Single Arc Waterhouse Lamps in good order, and Line Wire No. 4 B. & S. and No. 2 B. & S., of the Safety Insulated Wire Company and Simplex Wire Company manufacture.

Parties in want of any of the above material, will please communicate with us for prices and particulars.
The Manhattan Electric Light Co., Limited,
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WANTED.—ELECTRIC LIGHT SALESMEN to travel in New England States. None but first-class men with experience need apply.

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ELECTRIC BELT.

TESTIMONIAL.

OFFICE OF
THE BRADFORD ELECTRIC LIGHT AND POWER CO.,
OFFICE AND STATION,
Nos. 48 and 50 CHESTNUT STREET,
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CHAS. A. SCHIEREN & CO.,
Nos. 45-51 Ferry Street,
New York City.

DEAR SIRS:

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON AUGUST 12, 1890.

433,948 Electric conductor terminal. 434,087 Electric rail connector; Charles A. Lieb, New York, N. Y.

433,981 Telephone; Edward Davis, Cambridge, Mass., assignor of one-half to E. B. Welch, same place.

434,007 434,008 Machine for covering insulated conducting wire with lead; Lewis W. Tracy, New York, N. Y., assignor of one-half to James E. Granniss, same place.

434,011 Vertically adjustable dynamo support; Thos. Wrigley, Oak Park, assignor of one-half to Francis B. Badt, Chicago, Ill.

434,017 Method of welding metals by electricity; Herbert E. Fowler, New Haven, Conn., assignor of one-half to D. T. Hedges, Sioux City, Iowa.

434,024 Electro-therapeutic appliance; Gustave Moureth and Wm. M. Gibbons, Chicago, Ill., assignors by direct and mesne assignments to said Gibbons and Chas. C. Bateson, same place.

434,030 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor by mesne assignments to the Thomson-Houston Electric Co., Boston, Mass.

434,032 Ammeter and voltmeter; Gustav Pfannkuche, New York, N. Y., assignor to the Brush Electric Co., same place.

434,034 Support for car motors; Sidney H. Short, Cleveland, Ohio.

434,036 Trolley for electric railway; Joseph H. Wehrle, Newark, N. J.

434,038 Automatic electric lamp hanger and switch; Oscar B. White, Cleveland, Ohio.

434,063 Brake mechanism for electric street cars; Joshua Illingworth and Amos M. Baker, Cleveland, Ohio.

434,076 Underground electric conduit; Franz G. C. Zopke, Berlin, Germany.

434,093 Secondary battery. 434,301 Method of making electrodes for secondary batteries; Paul Schoop, Zurich, Switzerland.

434,096 Rotating part of dynamos and motors. 434,363 System of transportation by electricity in mines; Elmer A. Sperry, Chicago, Ill., assignor to the Sperry Electric Co., of Illinois.

434,144 Electric Insulator; John K. Dunbar, Austin, Texas.

434,147 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Co. of America, same place.

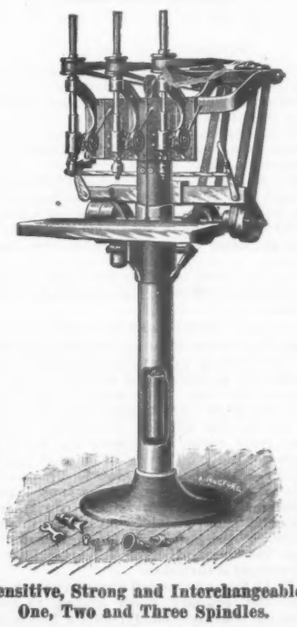
434,148 Electrically propelled vehicle. 434,275 434,360 434,391 Electric railway. 434 276 Current collecting device for electric cars; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., of Connecticut.

434,149 Cut-out and connection for electrical apparatus; Chas. J. Klein, New York, N. Y.

434,151 Switch for electric circuits; Philip Lange, Pittsburgh, and Oliver B. Shallenberger, Rochester, assignors to the Westinghouse Electric Co., Pittsburgh, Pa.

434,152 Switch for electric circuits. 434,153 Incandescent lamp socket. 434,154 Electric indicator; Philip Lange, Pittsburgh, Pa., assignor to the Westinghouse Electric Co., same place.

Sigourney Drills.
IMPROVED.



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Then neither wind nor weather,
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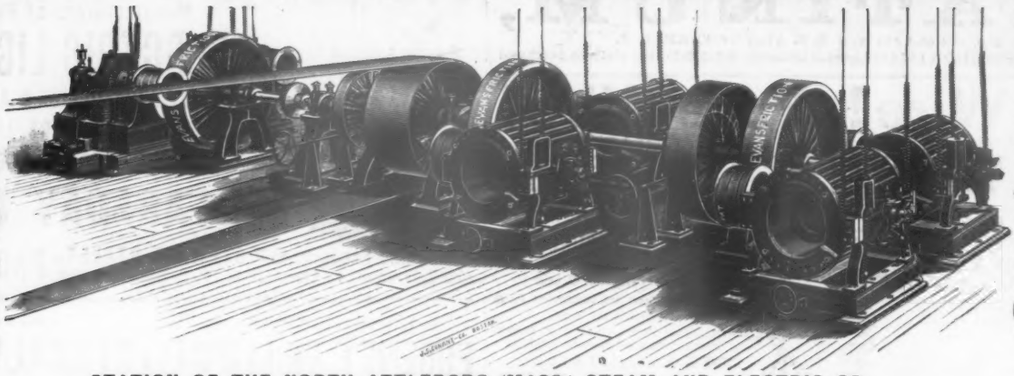

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High Standard of Workmanship,
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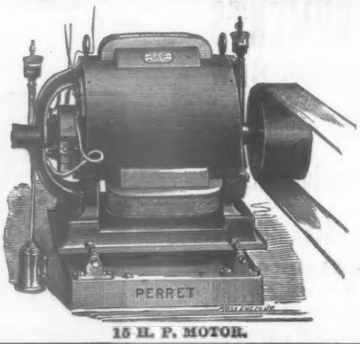

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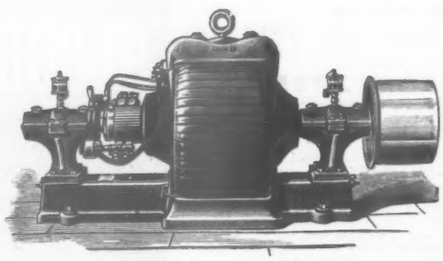

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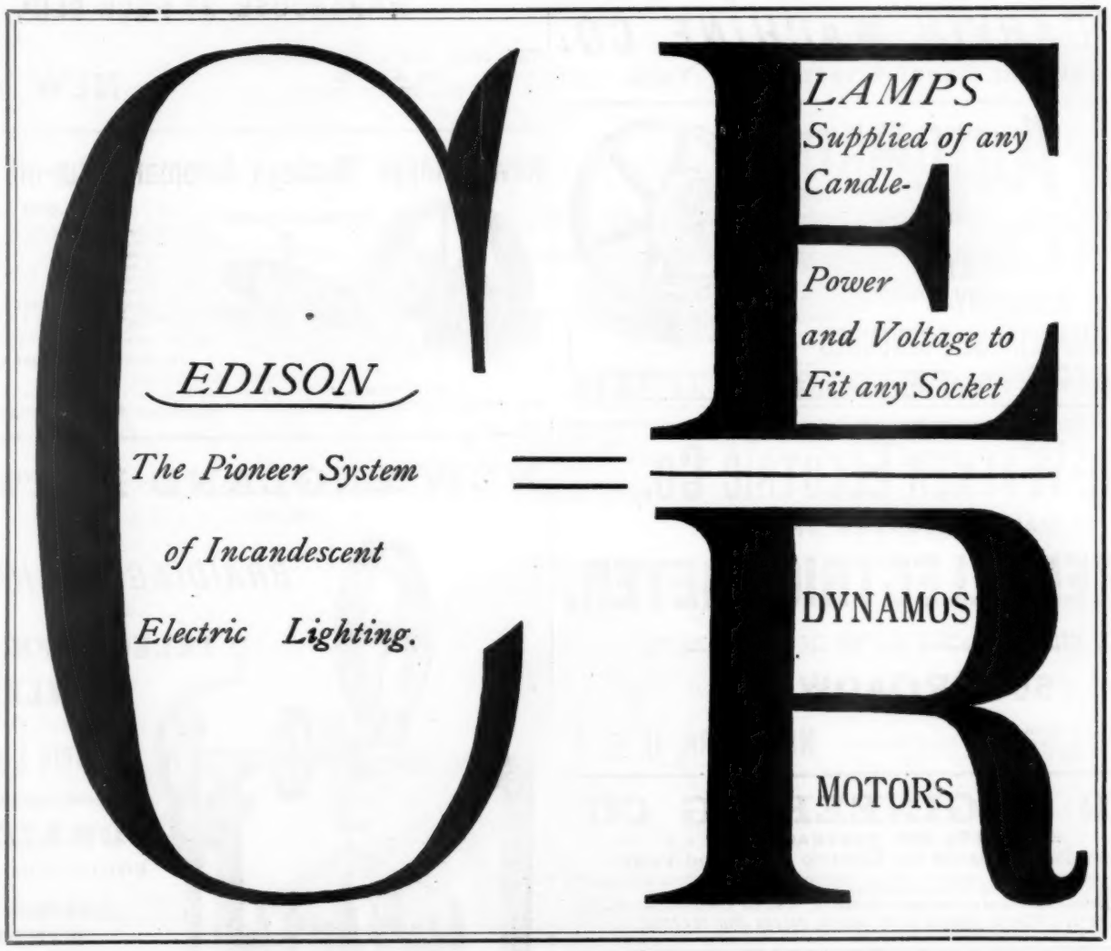

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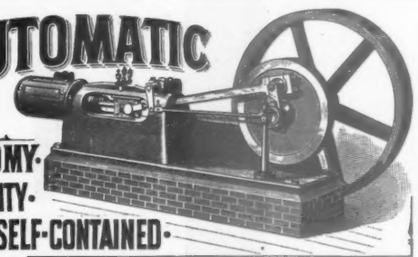

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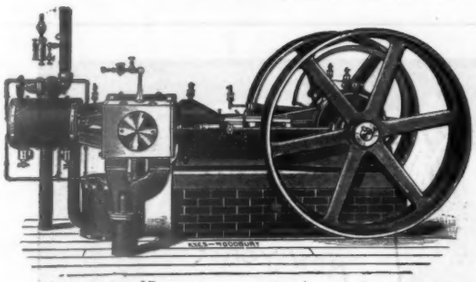

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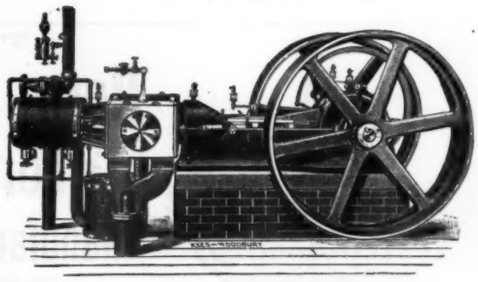

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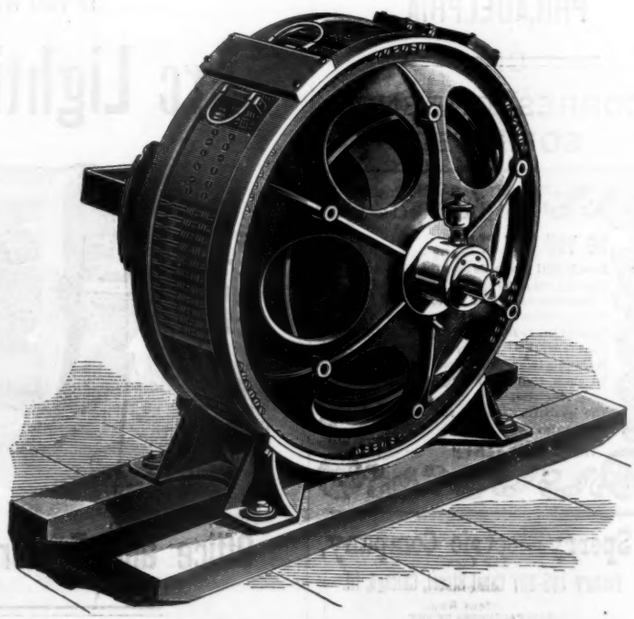

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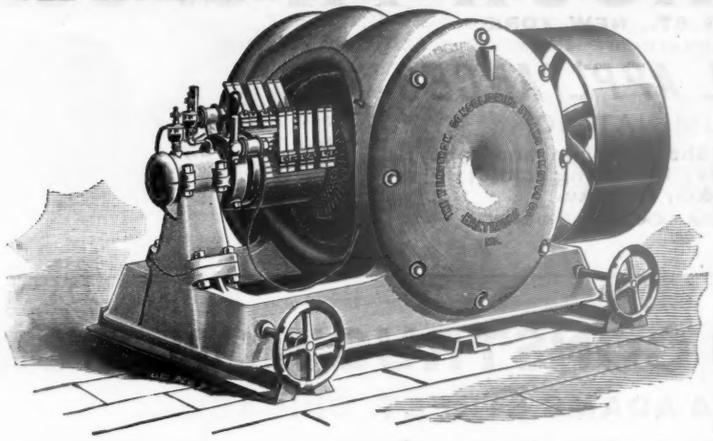

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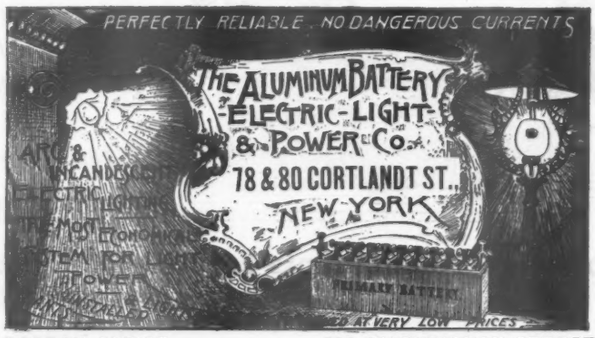

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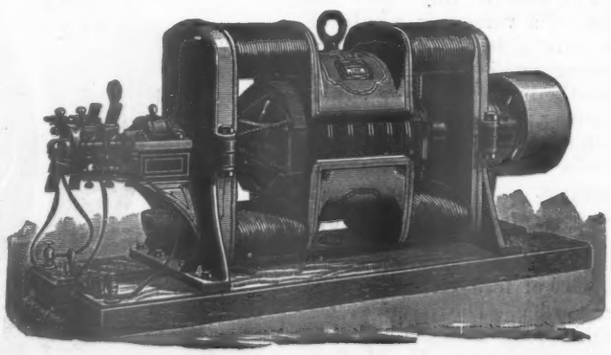

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C	8	.....	.....	.....	6.5	1¼	5,000 FEET PER MINUTE.	530
C	.....	10	.....	.....	6.3	1⅜		530
C	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2¼		780
E	.....	20	.....	.....	12.5	2⅜		780
E	.....	.....	26	.....	13.0	2⅜		780
G	20	.....	.....	.....	15.0	3		990
G	.....	25	.....	.....	15.6	3		990
G	.....	.....	33	.....	15.0	3		990
G	.....	.....	.....	50	16.0	3		990
G	28	.....	.....	.....	21.0	4½		1,360

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Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,000 c. p. 8 amp. Y	No. Lights 1,200 c. p. 6 amp. Z	No. Lights 600 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in Inches.	Belt Speed Required.	Weight of Dynamo.
C	.....	35	.....	.....	21.0	4	5,000 FEET PER MINUTE.	1,360
C	.....	.....	45	.....	21.0	4		1,360
C	.....	.....	.....	70	21.0	4½		1,360
E	40	.....	.....	.....	29.7	6		1,750
E	.....	50	.....	.....	30.0	6		1,750
E	.....	.....	64	.....	29.5	6		1,750
G	52	.....	.....	.....	38.0	8		2,290
G	.....	65	.....	.....	38.6	8		2,290
G	.....	.....	83	.....	38.0	8		2,290
K	64	.....	.....	.....	46.5	10		2,770
K	.....	80	.....	.....	47.1	10		2,770
K	75	.....	.....	.....	52.5	12		2,300

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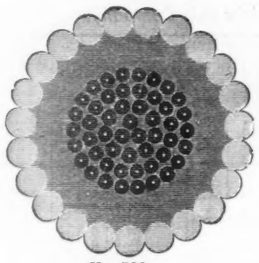

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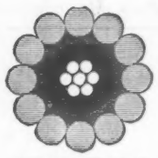
Conductors, each No. 20. Insulation, 3-32. Armor, 23 No. 6.



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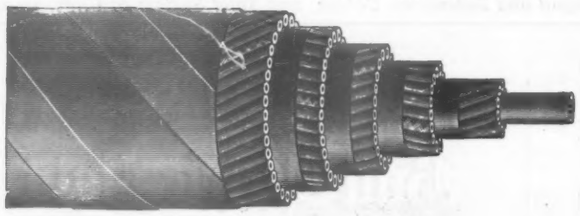

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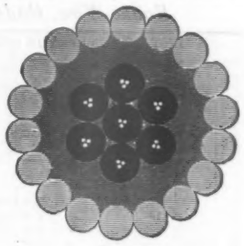

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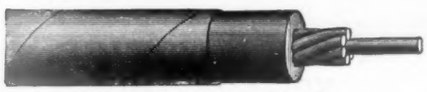

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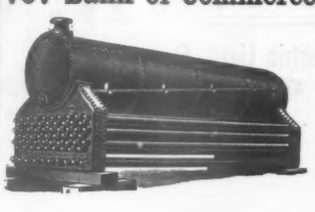

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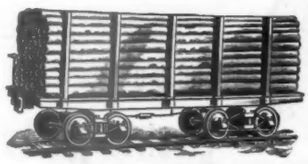

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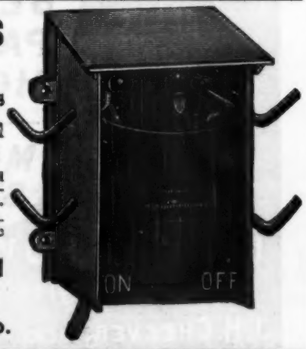

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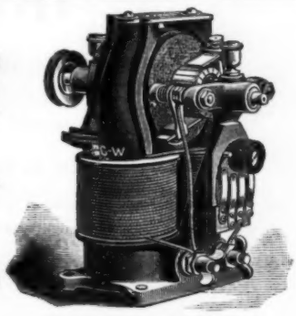

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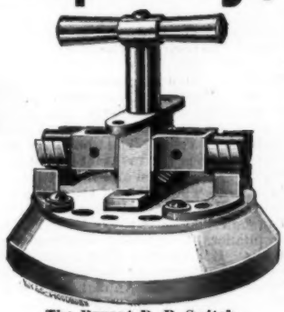

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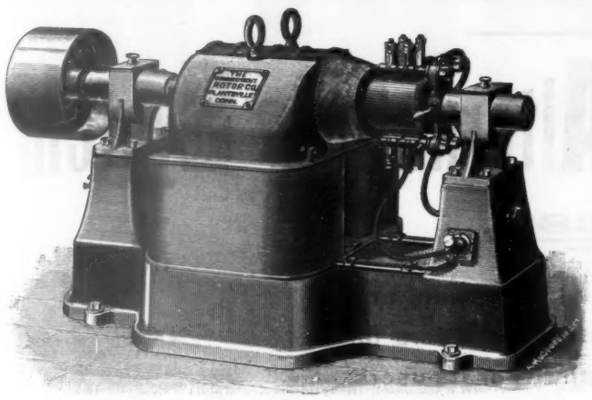

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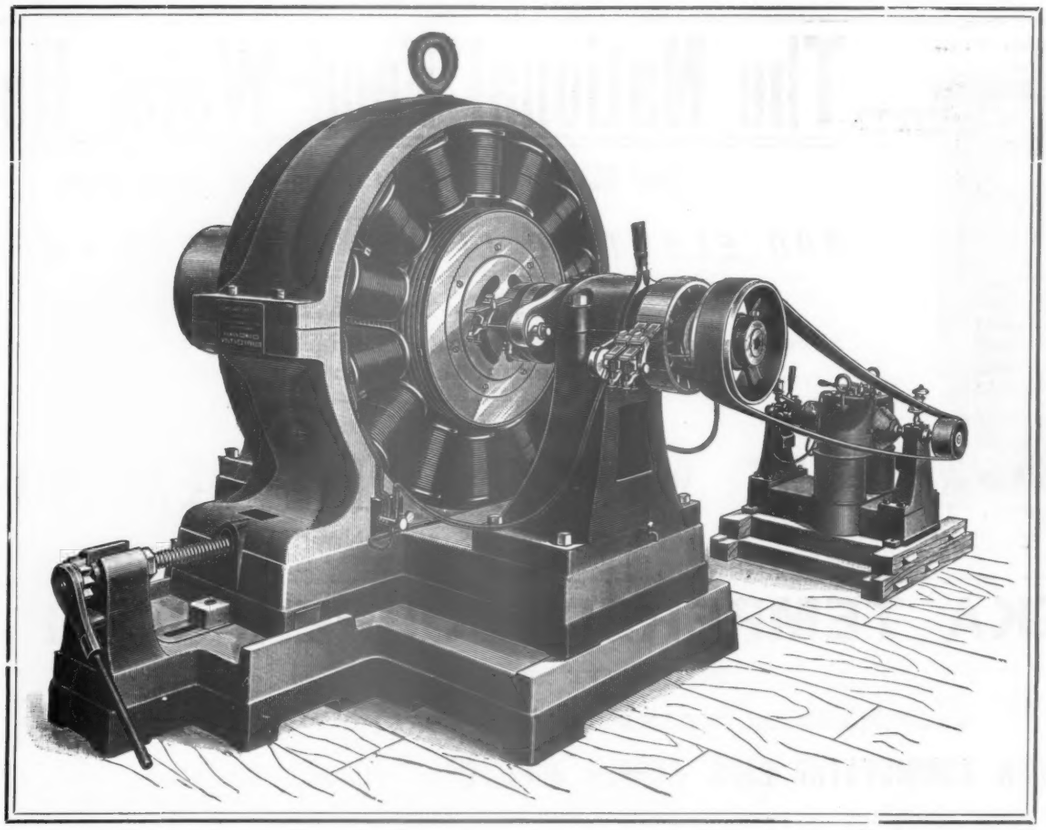

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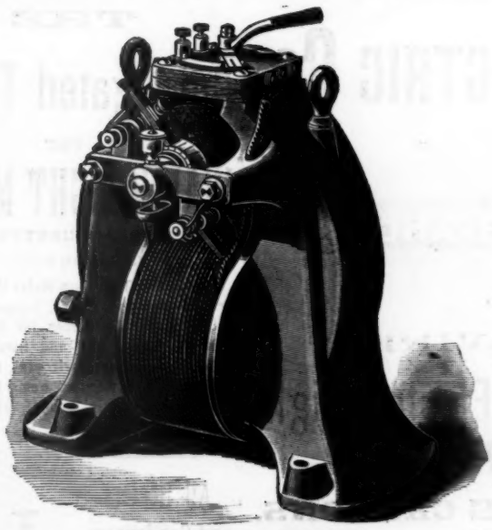

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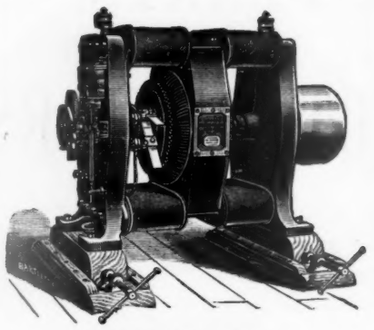

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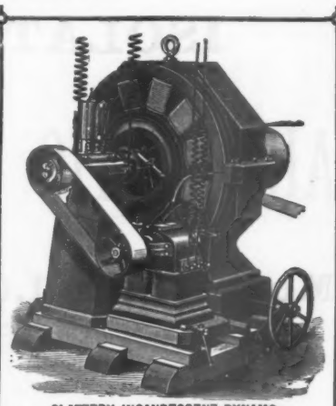

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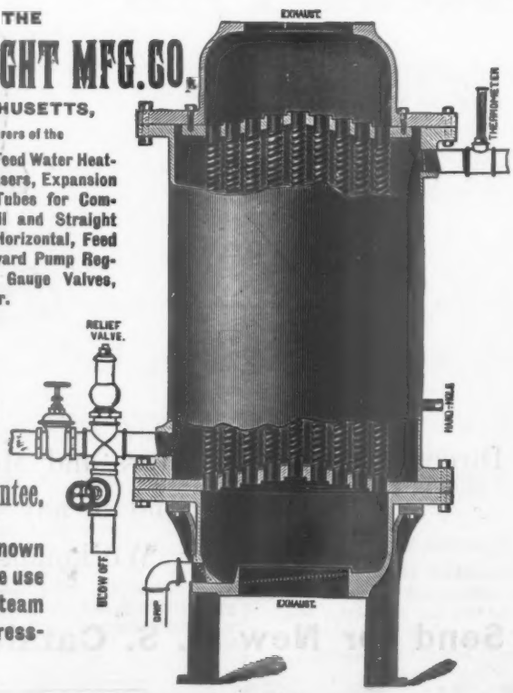

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